NATIONAL PETROLEUM NEWS

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Station, Bulk Plant Employes Essential—WMC's Corsaut

Special to NPN

WICHITA, Kans.—An interpretation that the maintenance of bulk plants and filling stations is an essential activity, in addition to the repairing and servicing of automobiles, has been made by Chas. W. Corsaut of the War Manpower Commission in a letter to the Kansas Oil Men's Assn. He said such employes who are considering change of employment should be informed they must obtain releases from their present employers. His letter follows:

Kansas Oil Men's Association,
211 Broadview Hotel, Wichita, Kansas.

In order for the War Manpower Commission to best serve this country during the emergency, all industries that are essential to the War Effort must be protected, and we must all realize that we must avoid labor turnover between essential industries.

The War Manpower Commission considers the provision of automotive repair and service an essential industry and, in our interpretation, the maintenance of bulk filling stations is included in such essential activities.

Employees who are contemplating making a change in employment should be informed that it is necessary to obtain a release from their present employers and possibly from this office before transferring from one essential industry to another. The War Manpower Commission will soon issue a directive requiring persons going into war industry jobs to obtain such employment through the United States Employment Service.

We are here to serve you and to keep your industry manned, and hope you will avail yourself of this service.

Yours very truly,
CHAS. W. CORSAUT, *Manager*
United States Employment Service
War Manpower Commission.

Ickes Asks Oil Industry For 4500 Wildcats

NPN News Bureau

WASHINGTON — Need for finding more crude oil reserves calls for a minimum drilling program of 4500 wildcats in 1943—"50% more than were ever drilled before in a single year" —PAW Chief Ickes said March 2.

The most liberal estimates place new reserves found in 1942 at 801,000,000 bbls., 57% of consumption, he said. PAW added:

"This expanded effort must get under way immediately if the increasing essential requirements for petroleum products are to be met. Each company should review its holdings of prospective oil leases, select those areas having the greatest probabilities of producing oil, and test them as quickly as possible.

Need Extensive Wildcatting

"The number of structures that may be found by geophysical methods is diminishing. Therefore, more fields of the non-structural type, which cannot be so readily located by geophysical methods, must be found to maintain the diseovery rate. Fields of the non-structural type usually must be found by extensive wildcatting and, on the average, more wildcat wells must be drilled to find each such field."

Materials shortages make it necessary that only locations with "definite merit" be drilled, PAW added, saying preference would be given to exploratory wells when materials pie is cut.

Secrecy De Luxe

The Acme, or Something, was Reached at Chicago Tire-Saving Meeting. NPN Gets Its Dope Sub-Rosa, and Worries Over Fate of Daredevil 'Informant'

NPN News Bureau

CHICAGO—New, mountainous heights of absurdity in the monumental program of secrecy were surely scaled here March 1.

OPA came to Chicago to hold a meeting with mid-western oil men on tire conservation. The idea was to persuade the oil industry to participate in an expensive, nationwide advertising campaign to put tire conservation on the tip of every tongue. OPA was out to get oil men to preach the severity of our rubber situation at the slightest provocation; to declare that the nation's transportation system would suffer a pneumatic breakdown if rubber wasn't saved.

And—this is the incredulous part—the press was barred from the meeting.

Your Chicago reporter marched to the door of the crowded Blackstone Hotel ballroom and was met by an upraised hand. "All the press is being excluded," said the guard. A Press release would be issued after 5 p.m.

Guard Stirred to Action

But wasn't this an important meeting? Wasn't it something every oil man should know about? Surely this must be true if Dr. Charles F. Phillips, chief of OPA's automotive supply rationing division, and Charles Johnson (Ohio Oil), chairman of the District 2 tire, battery and accessories group, journeyed to Chicago for the pow-wow.

This stirred the guard somewhat and within 2 minutes we were handed a packet of papers, being a complete set of advertising matter on the tire conservation program—mimeographed letters, miniature cuts of window displays, interior displays, newpaper and radio spots, direct mail and what have you.

But still the press was excluded from the meeting.

Still full of curiosity several hours later, we dug for some gossip on the meeting. We discovered an "informer". He took his life in his hands and told us this:

What Went On

After the "speeches" were made, a couple of oil men asked some questions. One of them asserted the 25c fee for on-wheel tire inspections was not enough. Would OPA investigate further and raise the ante?

"No".

The other oil man objected to the 32 lb. tire pressure OPA insists upon, since, he said, tire manufacturers have for years stressed accuracy varying from 28 to 35 lbs., depending on the tire.

Our "informer" ripped aside another veil of secrecy and told us what OPA replied. Said OPA: The 32 lb. pressure will take care of 90% of the country's tires without injury even though manufacturers have specified anywhere from 28 to 35 lbs. (Isn't this something new? We try to follow OPA regulations but this one is foreign to us. We'd like to know on what engineering data such a decision was reached and an order issued—Cleveland eds.)

Now—This reporter would like to bet somebody a new spring hat (or the cash if hats are rationed tomorrow) that these startling revelations from the secret meeting, when read by oil men this week, will not create panic. We think, however, that our "informer", if caught, will be crucified. We are taking all steps to protect his identity.

Might Reduce 'A' Rations To Get Better Cars For Essential War Use

NPN News Bureau

WASHINGTON — Possibility of requisitioning private passenger cars or inducing sales of cars supplied with "A" gasoline rations by further reducing those rations was raised by an ODT official at a New York transportation conference, according to ODT spokesman here.

Charles L. Dearing, Chief of ODT's division of special studies and review, told conference on employe transportation that one of problems confronting ODT is that older cars are owned by people who need transportation the most, while the "A" cars are younger and belong to people who are not in such great need of private transportation.

When he was asked at a question and answer period what the government planned to do, Mr. Dearing remarked that requisitioning would be the quickest way but presented "insurmountable" obstacles.

Suggests "A" Unit Reduction

Alternative, Mr. Dearing said, might be to reduce "A" coupon values so it would be economically unsound to keep cars. This would force them in normal trade channels where war workers would have a chance to buy them.

Mr. Dearing emphasized no decision had been reached on how to effect a redistribution of cars, ODT spokesman said.

Crude Freeze Unknown at PAW

NPN News Bureau

WASHINGTON — Top-ranking PAW officials March 2 said they had learned nothing about any move to freeze crude oil connections and takings as of Jan. 1, 1943. Reports to this effect had spread among Mid-Western refineries. Some producer representatives at Petroleum Industry War Council meeting here said they, too, had heard such reports but could not identify the source. Presumably, the move—if it were taken—would be to safeguard the supply of smaller refiners.

CHICAGO OIL ROUNDUP

:: *News and Gossip in the Mid-West* ::

CHICAGO—Appointment of 3 mid-western state chairmen in the new ODT set-up for seeking further ways and means of reducing truck mileage on retail deliveries with resultant savings of rubber and equipment has been announced by Leo Huff, Chicago, Pure Oil Co., consultant to Mr. Eastman.

Further appointments of District 2 chairmen are pending, Mr. Huff said. They are made by the ODT petroleum transport advisory committees of each state.

The 3 chairmen already named are J. H. Taylor, Chicago, W. H. Barber Co., for Illinois; C. T. Kallman, Chicago, Standard of Indiana, for Indiana; and J. H. Budde, Milwaukee, Standard of Indiana, for Wisconsin.

Each state is to be divided into districts, Mr. Huff explained, and each district is to have a subcommittee of 3 men, one of which will act as chairman. There are 14 such areas in Illinois, 11 in Indiana and 10 in Wisconsin. Setting up of like arrangements in other states of District 2 is now being worked out.

State chairmen will cooperate closely with jobber associations and other similar organizations in development of the program. Mr. Taylor, Illinois chairman, has already been assured the assistance of Illinois Petroleum Marketers Assn., through G. A. Primm, association secretary.

The committees will deal strictly with transportation, Mr. Taylor said in outlining his plan, and will have nothing to do with bulk plants, terminals, exchanges, etc.

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Final Report on 'Joint Use'

Final report of the joint use of marketing facilities subcommittee, District 2, headed by H. T. Ashton, is now being written. The report is to be ready for a committee meeting March 9, and probably will recommend adoption of Methods 1-a, 1-b and 2 only, providing for increased dump size, intercompany use of bulk plants, and other internal efficiencies. Previously, the thought was for adoption of the plan down through Method 4 in some rural areas.

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One Chicago oil man, marvelling the other day at the 24-in. war emergency pipeline, opined it wouldn't be long before they'll be transporting canned motor oil via underground tubes. We think it's a good idea. While they're at it, they can shoot a few cans of coffee up from Brazil.

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Wildcats Were Ready to Fight

A flurry of anger and apprehension was felt throughout the Mid-West when many independent lease brokers, abstractors and large oil company land and lease department men discovered their "C" books for gasoline would not be renewed March 1 under prevailing OPA regulations.

Local rationing boards over the territory were refusing renewal of the "C" books with comment that "because lease and title men work for oil companies does not alter their status and entitle them to preferred mileage." One lease man employed by a large oil company in Illinois had the balance of his old "C" book taken up by the OPA state office at Springfield on that basis.

The regulation worked like a stop order on development, and a sigh of relief came from wildcatters and development men in the Mid-West when Russell Brown of I.P.A.A. in Washington secured an adjustment of the ruling by calling it to OPA's attention.

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Rations Hit Way to Man's Heart

Not asleep at the wheel by any means, the Chicago Oil Men's Club took advantage of a current condition to hail members to its bridge party Thursday, March 4. The club pointed out here was a swell chance to get still another good meal without burning up any food rationing coupons. The idea then is to get someone else to drive you so you won't burn up any gasoline rationing coupons, or have someone carry you piggy-back so you won't burn up any shoe rationing coupons.

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Mid-West Tubular Goods

Supply of oil well casing, tubing and other tubular goods, which has been extremely tight in oil field areas under priorities procedure, has eased off considerably. Adoption of the new allocations plan for oil field material, and 3 steel mills now in production, are getting results, PAW's District 2 office reports.

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A city official in charge of street lighting said at the Chicago Oil Men's Club the other day that it costs $33 a minute to burn the city's street lights, and that they were 15 minutes behind schedule. This is being adjusted 1 minute per day, he said.

Wartime costs the city "a little more" than regular time, his figures showed. And it gets a heluvalota Chicago oil men out of bed via the alarm clock instead of the natural wake-up, we add. Someone should figure out what it costs a minute to burn the candle at both ends.

Worry's Over—Russ Won't Sue

Mary Mallon of the National Petroleum Assn. thought that NPN, in order to rectify its glaring error of publishing Frank Buttram's picture and labeling it "Russell B. Brown" (*NPN Feb.* 10, *p.* 20), should publish Russell Brown's picture "up in the page 2 position of the next issue of the News".

So, we are.

The smiling gentleman at the right, gentle reader, is Russell B. Brown, able general counsel of the Independent Petroleum Assn. of America.

Frankly, the error had NPN's editors worried. It also worried Frank Buttram, who was fearful that Russell might sue for libel—or something. So Frank took steps to protect himself against court action.

Russell Gets Fan Mail

But Russell wasn't displeased at all. He got lots of fan mail. Lots of people he hadn't heard from for a long time wrote him to comment on his good looks, he confided in a letter to NPN on Feb. 15.

Said Russell: "I am receiving many comments as to the improvement in my appearance. One went so far as to ask me to please furnish the prescription which I had used to accomplish this marvelous development. The concluding sentence in that note was: 'You certainly have turned out to be a handsome brute.' " (Take a bow, Frank).

Trying to escape legal entanglements, Frank was too busy to bow. He wrote former Congressman William P. Cole, Jr., on Feb. 18 appealing to him to act as witness on his behalf "should he (Russell) become unduly wrought up and institute libel proceedings against me."

Cole Rushes to Frank's Aid

Mr. Cole, who headed the House oil investigating subcommittee during 8 of his years in Congress and who now sits on the U. S. Customs Court bench in New York, came to Frank's aid. He wrote the I.P.A.A. prexy as follows:

Russell B. Brown

"Should Russell Brown institute libel proceedings against you, or the National Petroleum News based on page 20 of the February 10th issue of the NPN and you require any witnesses to support your case, mark me down.

"My Court doesn't have jurisdiction of such cases so I can freely express an opinion.

"It might be that after you bring this to the attention of Russell that he will concede the validity of the claim and comfortable damages will be recovered. Sincerely yours."

Frank hurried copies of his correspondence with Judge Cole off to Harold B. Fell, executive vice-president of the I.P.A.A., to further buttress himself against legal attack.

NPN has been told privately, however, that Russell won't press suit.

I.O.J.A. Opposes Elimination Of Free Enterprise in Oil

Special to NPN

MANCHESTER, Iowa—Iowa Independent Oil Jobbers' Assn., which has just completed 4 "area meetings" throughout the state in lieu of an annual convention, went on record in a resolution opposing "any changes in the present system of free enterprise in the distribution of petroleum products which would have a tendency to eliminate the independent marketer".

The resolution stated the independent jobber depends entirely on marketing for his livelihood and therefore of necessity must operate under the most efficient of methods and practices in order to avoid business failure.

In another resolution, I.O.J.A. called upon its officers and directors "to continue their efforts toward the end that an operating margin be established which will permit the most efficient functioning of the jobbing business."

John W. Schultz, Davenport, was re-elected president along with all other officers and directors.

I.I.P.A. War Convention Set

Special to NPN

INDIANAPOLIS—Indiana Independent Petroleum Assn.'s board of directors has set March 10 and 11 for a 2-day "victory convention" at the Hotel Severin here.

I.I.P.A. lists the following speakers:

H. T. Ashton, St. Louis, chairman of the District 2 joint use of marketing facilities subcommittee; Carroll W. Johnson, Chicago, District 2 PAW marketing director; Sam F. Niness, Washington, chief of the ODT's petroleum carrier section, motor transport division; Hugh J. Baker, Jr., chief rationing attorney, OPA; W. H. Snyder of OPA's enforcement division; William Aitchison of OPA's rationing division; W. I. Cotton of OPA's fuel oil division; J. Bradley Haight, special representative, War Manpower Commission; J. Penfield Seiberling, Seiberling Rubber Co.; and Dr. John L. Davis, popular humorist.

New York Marketers To Meet

NPN News Bureau

NEW YORK—Empire State Petroleum Assn. will hold its second annual meeting March 11 at Hotel Onandaga, Syracuse, N. Y., with Warren C. Platt, editor and publisher of NPN, and A. Clarke Bedford (New Jersey Standard), chairman of the District 1 joint use of marketing facilities subcommittee, as principal speakers.

John Harper, E.S.P.A. president, and Harry B. Hilts, secretary, report resolutions on the following will be acted upon at the convention:

1—Centralization of wartime authority over the oil industry.

2—Inclusion of greater jobber, distributor and dealer representation on industry committees.

3—Request for price adjustments to insure independent jobbers and marketers continued financial stability.

4—Construction of a trans-Florida ship canal.

5—Overhauling of OPA's fuel oil rationing system.

Producer Answers Sinclair

Thomas Galey, Independence, Kans., sees Collectivism in Consolidating Oil Industry and Fears any Experiments Under New Deal's Regime

NPN News Bureau

CLEVELAND—An answer to Harry F. Sinclair's suggestion of "how the oil industry can contribute more to the winning of the war" came Feb. 24 from Thomas M. Galey, independent producer of Independence, Kans. Text of his letter to Mr. Sinclair, a copy of which came to NPN, is printed below:

Mr. H. F. Sinclair,
Consolidated Oil Corporation
630 Fifth Avenue, New York.

Dear Mr. Sinclair:

You invite comment on your suggestion: "How the Oil Industry Can Contribute More to the Winning of the War". My comment is from the standpoint of a producer of crude and a consumer of oil products.

Whether intentional or not, your proposal hits into the unknown, a new order which will come out of the war. That order is a form of socialism or collectivism which will change the old order of competitive business. Under government, it will at first function in more compelling attempts to dictate distribution of necessities such as transportation, communications, electricity and fuels. Where it will stop we can't guess. It will no doubt become total if there is a Fourth Term under Roosevelt. If under Wallace, God help us. Under a business man, Willkie perhaps, an experiment might be attempted with some degree of confidence.

What is distribution waste? When does it become undesirable? Where does it apply or not apply?

Suppose the big oil units get together under a perfect set-up which increases efficiency and economy of operation and distribution. What is the reward to be expected?

No doubt thousands of men and tons of equipment would be made available for use elsewhere. That may be a debateable contribution to the war effort. Under the New Deal set-up, an attempt at "efficiency" in civilian industry may have serious repercussions later. Waste in the marketing of petroleum products is a drop in the bucket compared to the scandalous waste in the cost-plus system in the war industries. For instance, there is the waste of money and manpower in the airplane factories near Wichita, Kansas. That is only one small spot. Waste seems to be expected and compromised under bureaucratic government. A lot of people have suddenly decided to get rich. It might be well for Government to clean house in Washington and the war industries before the petroleum industry bothers to introduce economies.

If a perfect set-up cuts to a minimum the cost of distribution per unit, the resultant saving of money would become a target for the sharpshooting professors in OPA. The saving would be consumed in taxes against each unit and OPA would have one more reason to depress the price of crude and its products. Mr. Morgenthau would have one more reason to demand cancellation of the depletion set-up and a dangerous precedent of entanglement of big business would have been established. If you trust New Deal Government and if a Fourth Term ensues, you would certainly have to fight your way out of a sorry mess. The stripper well producer would be in the same boat, only worse.

What would happen to me as a consumer if economy and efficiency lessens the cost of the petroleum products I purchase? Under the arbitrary taxing powers of the states, I would be socked with more and more taxes because of the easy collection of that sort of tax. There won't be so many automobiles in the post-war future because of high priced gasoline and the better organization of public transportation.

Under New Dealism, I am not so sure that Mr. Davies' recommendations are "farsighted". Economy of distribution would have to be organized under bureaucratic government. Standardization of products would become necessary and some sort of communal distribution under a Czar. That means Collectivism. I don't see how an organization for economy can be safely effected under New Deal philosophy in its interpretation of our Anti-Trust Laws, even under suspension instituted under the Second Session of the 77th Congress. Burned fingers aren't easily forgotten.

The handwriting is on the wall. Some of it can even be seen among the top personnel in PAW and OPA. Some personally ambitious Little Napoleons are developing among certain deputies. Personal greed and thirst for power is incident to bureaucratic government. A thing to expect is that government will take over the oil industry the minute that it is determined that the Military is short of petroleum requirements in 1944, or earlier. The industry will be operated under a general or an admiral.

No doubt it might work better that way than under the crazy restrictions which so gravely endanger our petroleum supply in the event of a long war. In Tulsa, it is said that FBI agents have suggested that no organized effort toward crude price increase would be tolerated. A general or an admiral would no doubt make operative the old law of supply and demand and not even stick out his neck.

Under necessity, the problem of petroleum supply must be solved NOW. It can't be done quickly by increasing secondary recovery. We must have new big flush production and that could be gotten. A lot of operators are puzzled because of the continued failure of government to open the way; a lot are getting damned suspicious, hence would welcome a military regime.

If your proposal is appraised on the New Deal's philosophy of jobs for all under pampered unionism, jobs under industry or assured under government, then why shouldn't business-as-usual go "merrily on"? It doesn't make much difference under socialism whether John Doe works for the Consolidated Oil Corporation or for Uncle Sam. And, on the other hand, if your proposal is appraised on the basis of direct public economy, then, under New Dealism, distribution of petroleum products would become a foot-ball of bureaucratic persecution. Just what it would contribute to the War Effort is another proposition which must be based on pure patriotism.

Briefly, I doubt if your proposal can be *safely* worked out under the conditions.

Very sincerely,
(S) Thomas M. Galey.

Urges Filling Storage Tanks Of Consumers This Summer

Special to NPN

COLUMBIA, S. C.—A change in fuel oil rationing regulations to permit maximum utilization of consumers storage tanks is urged by W. L. Heinz, president of the South Carolina Oil Jobbers Assn., in a letter Feb. 25 to Joel Dean, OPA fuel rationing chief.

Relief from Harassment Asked by Makers Of Computer Pumps

NPN News Bureau

CHICAGO—Computer pump manufacturers have applied to the War and Navy Department for relief for duration of the war from the "terrific harassment" of the criminal information filed by the Justice Department Feb. 15 in the U. S. District Court here, according to Charles Byron of Wilkinson, Huxley, Byron and Knight, attorneys representing Wayne Pump Co., Ft. Wayne, Ind., one of the defendants.

Mr. Byron said the pump manufacturers are now doing almost 100% war work, which made it very difficult for them to prepare an answer to a complicated case of this kind. The Justice Department charges price fixing and monopoly in violation of the Sherman law.

"It's up to the government to decide whether it wants us to fight the suit or the common enemy, the Axis," he declared.

Defendants in the case, in addition to Wayne, are B. F. Geyer, its president; Tokheim Oil Tank & Pump Co., also of Ft. Wayne; Gilbert & Barker Mfg. Co., West Springfield, Mass., and C. S. Hope, its president; Veeder-Root, Inc., Hartford, Conn., and its president and vice-president, G. H. Anthony and J. H. Chaplin; Gasoline Pump Manufacturers Assn., New York, and G. Denny Moore, its director.

Oberly States Position

Chester C. Oberly, Tokheim's president, declared in a statement to NPN: "This charge is substantially the same as the indictment returned in Chicago, Jan. 31, 1941, and which charges were subsequently dismissed on Feb. 17, 1942, by Judge Phillip L. Sullivan in the United States District Court at Chicago.

"The decision rendered by Judge Sullivan was then appealed by the Department of Justice to the U. S. Supreme Court, which court affirmed Judge Sullivan's decision on Dec. 7, 1942."

Tokheim is now in its fourth year of manufacture of war materials, Mr. Oberly said, and at the present time 95% of the factory production is strictly on war materials.

"It is extremely unfortunate that this case should be again brought up during this time of intensive war effort," he said, "and which necessarily will greatly divert efforts of the management from production of war materials because of the necessity of preparing and engaging in the defense at the trial proceedings."

Oberly's Statement Quoted

Tokheim's president said:

"We do not consider that we are guilty of any violation whatever of the existing laws in the charges recently made claiming monopoly in the manufacture and sale of computer type gasoline pumps.

"The computer type gasoline pump, such as we manufacture, is manufactured by us under a license from The Wayne Pump Co., owners of the patents granted covering the particular type of computer pump referred to. The U. S. Supreme Court has issued several decisions in the past upholding the right of the owners of patents to fix the minimum selling price of articles covered by such patents where such articles were manufactured under license by their competitors.

"Extending of licenses by the Wayne Pump Co. was for the purpose of giving several gasoline pump manufacturers the privilege of manufacturing this type of pump, thereby creating a greater demand and use of the improvement, rather than creating a monopoly."

"The records will show that after The Wayne Pump Co. licensed several other gasoline pump manufacturers to make computer pumps under their patents, that the sales by the Tokheim Oil Tank and Pump Co. declined due to the competition of the other manufacturers entering the field.

"Further," statement adds, "a study of the profits of all gasoline pump manufacturers making the computer pump will indicate clearly that the prices established did not result in even a normal profit, which indicates that the minimum prices established were not unduly high by virtue of having been established under a patent license."

Regarding renewal of the case, Daniel B. Britt, special assistant to the attorney general, said: "The case has been re-filed because there was no determination upon the merits of the facts set out in the indictments and defendants were not subjected to any jeopardy."

Cleveland Oil Club To Discuss Fuel Oil Rationing March 15

NPN News Bureau

CLEVELAND — A special luncheon meeting of the new Cleveland Petroleum Club has been called for March 15 to consider problems arising from the rationing of fuel oil, including conversion of burners. Ernest L. Hughes, Hughes Oil Co., Chicago, member of District 2 wholesale tank car marketers subcommittee handling fuel oil, will speak.

Dr. W. P. Edwards, chairman, Cleveland Manpower Committee, formerly personnel director for Standard Oil Co. of Ohio, talked before the club March 1. He emphasized that oil marketing companies are conducting essential enterprises and that the men at dealer and company stations who do mechanical work on cars are in highly essential employment.

J. G. Jordan, division manager for Shell Oil Co., Inc., Cleveland, chairman of the month-old Cleveland club, is being transferred to the Shell offices at San Francisco, he told the meeting. A. L. Bailey, treasurer Canfield Oil Co., was elected chairman to replace him.

Canada Orders 200 Tank Cars

Special to NPN

OTTAWA—To offset a shortage which has developed because of the war, the Canadian government has ordered 200 new railway tank cars, the Munitions and Supply Department announces.

Ohio Taxable Gasoline Consumption

(Compiled by Ohio Petroleum Marketers Assn. from State Tax reports)

Month	Gallons
December, 1941	131,745,051
December, 1942	81,066,033
Loss	50,679,018
Loss	38.467%
Year 1941	1,548,175,943
Year 1942	1,371,820,149
Loss	176,355,794
Loss	11.391%

DEATHS

Harry G. Seidel

Harry G. Seidel, European representative of Standard Oil Co. (N.J.), coordinator of marketing outside the U. S. and Canada, was among those lost in the crash of the Yankee Clipper at Lisbon, Portugal, Feb. 22. He was 52 years old and had been with the company for 33 years.

Mr. Seidel, native of Fitchburg, Mass., joined "ESSO" after graduating from Brown University. In the first World War he was in Bucharest during the German occupation of Roumania—the only American to stay in that city. Later he was held captive by the Germans. After the war he returned to the U. S. but in 1919 went back to Roumania where he became managing director of Standard's Roumanian subsidiary, Romano-Americana. Subsequently, he headed the Standard-Nobel in Poland.

Mr. Seidel came through the recent bombings of London without a scratch, although enemy planes scored hits on both his home and office. He had made numerous flights across the Atlantic and was returning to his post in London when the ill-fated Clipper plunged into the Tagus River at Lisbon.

He leaves a wife, a son, Harry G., Jr., a U. S. Army air cadet, and two daughters, Rosamond, an ambulance driver for the A.W.V.S. in New York, and Frances.

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Howard D. Atha

Howard D. Atha, 67, president of Gordon Oil Co., Mt. Pleasant, Mich., founder and 4 times president of the Oil & Gas Assn. of Michigan, died Feb. 23 at Battle Creek, where he had been under treatment.

Born at Mannington, W. Va., Mr. Atha became one of the leaders in the development of Michigan oil fields. He went there in 1925 after founding the Gordon company in Columbus, Ohio, in 1919.

He leaves a widow, a daughter, and a son, Edward, of the Army Air Forces.

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H. C. Hanna

H. C. Hanna, manager of the El Segundo, (Calif.) refinery of California Standard, died Feb. 18. He was a pioneer in California refining, having worked as a boiler maker in 1911 on the first tank at this refinery.

He had been manager of the plant since 1931, having risen from assistant superintendent and superintendent.

He leaves a widow, two sons and two married daughters.

"Big Inch" Moves Office

NPN News Bureau

WASHINGTON — War Emergency Pipe Line, Inc., has moved its offices from Little Rock, Ark., to Cincinnati where it is now occupying space in the Enquirer Building. Address is Post Office Box 1638. B. E. Hull is general manager.

NPN Reports

War Oil News and War Orders from

WASHINGTON

For ALL branches of the Oil Industry

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New 48 Hour Week

It Doesn't Apply to Establishments Employing Less Than 8. Labor Shortage Areas Under 48-Hour Week First, Others May Follow as Scarcity Grows

WASHINGTON — Service stations or other oil industry establishments employing less than 8 persons are exempt from the minimum 48-hour wartime workweek which was ordered by WMC Chairman McNutt in Regulation 3, made public Feb. 28. The 48-hour week will be applied first in the 32 acute labor shortage areas (*see NPN Feb. 17, p. 15*).

An important point here is that a station with less than 8 employes is exempt even though it may be part of a string of stations which employs a total of more than 8 persons in the particular labor shortage area.

Unless employes are paid overtime because of wage-hour law or other federal, state or local laws or because of labor union contracts, overtime pay for the extra hours worked is left to management and labor for settlement. WMC took no stand one way or the other on that point.

Put Into Effect Gradually

Generally, effective date of the new workweek is April 1, but that is not a hard and fast date for it will go into effect gradually, beginning at once in some cases and maybe dragging on after April 1 in others.

If an employer can increase his workweek to 48 hours without releasing workers, he is expected to do so at once.

If area or regional manpower directors tell an employer he can release workers, who can be employed somewhere else, by starting the 48 hours week, he is expected to do so, also at once.

Otherwise, the employer is to submit to local WMC officials by April 1 an estimate of how many workers will be released by the longer week and a timetable for letting them go. He is to wait, however, until WMC approves his timetable before he inaugurates it—thus giving WMC opportunity to place the freed workers as they leave the employer's establishment.

Thus, the basic principle of the order is clear—to free workmen who may be more urgently needed elsewhere in war production without hindering operations of their present employer who can maintain the same production rate with fewer people, longer hours.

For that reason, an employer is not expected to adopt the 48 hour week if by so doing he would not release any employes, or if the longer week would be impracticable for some reason in view of the nature of his operations (a movie house would not be expected to remain open until 3 a. m. just to comply with the order), or if a 48-hour week would conflict with a federal, state or local law limiting hours of work.

In those cases, however, a minimum wartime workweek of the greatest number of hours feasible in view of the employer's circumstances is required.

A 48 hour week is not required for youth under 16 years of age, nor for individuals who cannot work full time because of household responsibilities, other employment, or physical limitations. Latter would exempt working wives who need a day off to attend to housekeeping or marketing.

Administration of the new order will be left in the hands of regional and area manpower directors who have advisory panels known as labor management committees who are familiar with local industry and its problems.

Interpretation and individual application of the order thereby is left to the "horse sense" of area and regional directors.

Along with Regulation 3, Mr. McNutt issued General Order No. 5 outlining the areas where the 48 hour week will apply and General Order No. 6 making the 48 hour week applicable on a nationwide scale to lumbering and nonferrous metal mining.

(For list of the 32 labor shortage areas where the new work week is effective, see NPN Feb. 17, p. 15).

Lease Brokers Get More 'Gas'

WASHINGTON—OPA has sent to its field offices ruling which classes as "preferred mileage" the travel done by lease brokers, when they are working for an oil company, according to information obtained by Independent Petroleum Assn. of America which had protested OPA's previous ruling that such travel was not "preferred mileage", thus denying lease brokers supplemental gasoline rations.

Jobbers and Retailers Seek Showdown on Margins

NPN Staff Special

WASHINGTON—Oil jobber and retailer organizations, working from two directions, are seeking a showdown on increased margins to offset war-added costs and declining volume. Both warn of the danger of a breakdown in automotive servicing facilities in many areas unless something is done promptly.

OPA has told them that next move is up to PAW. In addition, the retailers have got to satisfy War Manpower Commission and Office of Civilian Supply. (*See NPN, Feb. 24*).

Jobber representatives on Petroleum Industry War Council—E. V. Weber, Cincinnati, and Royal E. Decker, Detroit—are asking that the council instruct the P.I.W.C. cost and price adjustment committee, Dr. John Gill, chairman, to go into question of marketing margins. Also, they are pressing PAW to make a recommendation to OPA for increased margins. (PAW has made many recommendations for higher prices to refiners and producers in various areas, but has done nothing about marketing margins.)

Retailers Take Issue with WMC

The retailer group is composed of Harry Wainwright, of Washington, Fred B. Moore of Boston, and John Dressler of Hackensack, N. J. This group represents the Eastern Conference of Gasoline Retailer Assns. They went to the mat with WMC officials who have opposed a retail margin increase so as to "starve out" station operators and force them into war plant work. Backing up the manpower agency were Civilian Supply officials who took position that there were "too many" stations. Retail representatives demanded to know just how many "excess" stations there were. They suggested that the matter be put on a manpower basis—that is, what is minimum manpower needed to operate a station.

Mr. Wainwright suggested it might be one man per 3000 gal. of gasoline sold per month (that is, 45,000 miles of travel for vehicles served), with lubrication and all other necessary services provided. This figure might not be exact, he explained, but it would serve as a starting point for discussions. OCS has agreed to send out field men to test out this minimum manpower figure. One of the cities to be tested is Springfield, Mass.

Residual Price Hike Near

Only other developments along the OPA price front were "spelling out" a 15c increase for Wyoming heavy crudes and a "spelling out" of Washington-Baltimore light fuel prices.

OPA approval of price increases for California heavy crudes is now expected in a "few days". Also, an upward price adjustment in blended residual fuels for Districts 1, 2, 3 and 4 is expected momentarily. It is reported that both of these price advances have been given the "green light" by Economic Stabilizer Byrnes.

Dean Asks Suggestions For Next Winter's Fuel Rationing Plan

WASHINGTON — Congressional critics of OPA's fuel oil rationing plan this season see a "ray of sunshine" in Fuel Rationing Director Joel Dean's letter to various members asking for suggestions in drawing up next winter's plan.

Mr. Dean explained that "we need suggestions" from every important group in direct contact with actual users of fuel oil in the rationed areas.

"We know that your constituents are constantly in touch with you," he wrote, "and that many of them have communicated with you about fuel oil rationing. From this source and from your own knowledge of the problem, you may have some suggestions which will aid us in formulating the plan for next year."

May Be 'Change of Heart'

Members take the letter as forerunner of a changed attitude of the war agencies—at least OPA—toward Congress and the public. According to Rep. Auchincloss, N. J., it "may be the dawning of a new day when cooperation will be encouraged and nourished between the legislative and executive branches of the government".

Other members, approached by NPN, were pleased at the "constructive attitude" the letter showed toward rationing and evinced a willingness to take the overture at its face value and make suggestions.

Members of Sen. Clark's mid-west fuel oil investigating committee are expected to frame their suggestions along the line of their report favoring a straight-line percentage cut based on use during 1941-2 heating season.

Will Relax Rationing Regulations Whenever Possible, Brown Says

WASHINGTON—Pointing to 2 recent relaxations of rationing rules—provision of "C" gasoline rations for those who cannot get to their jobs on "B" rations and removal of rationing restrictions on tire recapping with reclaimed rubber for passenger cars and light trucks—OPA's Brown said Feb. 25:

"War is going to be tough enough on civilians without adding any unnecessary burdens. I have instructed the staff of OPA to keep constantly alert to changing conditions and to relax any rationing rules without delay whenever it becomes possible to do so.

"Not a single OPA restriction," Brown added, "is going to last one minute longer than is necessary. On the other hand I think in all fairness I should say that no essential OPA measure will be relaxed prematurely, if the result would be to impede the winning of the war."

Shell Junks All 5-Year-Old 'Gas' Pumps in Inventory

WASHINGTON—Shell Oil Co. is junking all of its gasoline pumps in inventory which are over 5 years old—regardless of condition—and is junking "younger" pumps if their condition makes repair impractical.

This policy, which is part of Shell's scrap program, was explained by John I. Wheeler, the company's general storekeeper, reporting to R. T. Lawrence, chief of the petroleum unit in WPB's industrial salvage branch. During 1942, the Shell organization turned in over 16,000 tons of scrap materials for the war program. And that isn't all by any means.

"We are going over our plants, yards and other locations with a fine-tooth comb," Mr. Wheeler continued. "We are challenging every piece of material and equipment not in use, asking ourselves—do we have any foreseeable need for it? If not, we say let's junk it or sell it to someone who can use it to further the war effort."

In event that M-68-c (the marketing equipment limitation order) is amended, as has been proposed, to allow replacement of any installed pump, then Shell intends to apply the same policy at all of its locations, Mr. Wheeler said. In other words, any installed pump over 5 years old or any that cannot be repaired economically will be replaced by a pump from inventory and the old one junked.

As it stands now, M-68-c prohibits the replacement of any installed pump unless it is 9 years or more old (model years). A pump of lesser age can be replaced only if repairs cannot be made on the premises and then only if replaced by a pump of the same type. A visible pump must be replaced with a visible; a meter pump with a meter pump; and a computer with computer. If a station is closed and the pumps removed, the pumps cannot be installed again.

Mr. Lawrence highly praised Shell's program.

"Shell," he said, "has set an example which we hope other oil companies will follow. The war program needs copper and brass. And one big source of this scrap material is in obsolete gasoline pumps."

OPA Cuts Truck Tire Quota; Boosts Recaps for March

WASHINGTON — Truck tire quota for March is cut 13.3% under February, while recapping quota is increased 33.3%, OPA announced Feb. 25.

Truck tire, tube and recapping quotas for March and February are:

	Tires	Recapping Services	Tubes
March	299,000	460,000	292,100
February	345,122	345,065	298,935

Passenger car tire and tube quotas are:

	Grade 1	Grade 2	Grade 3	Tubes
March	321,827	253,000	644,000	735,914
Feb.	161,000	225,500	690,475	759,000

States Jog Congress On Rubber Delays

WASHINGTON — Concern felt by state legislatures over progress of the synthetic rubber program is evidenced by the number of resolutions from them addressed to Congress.

Speaker Sam Rayburn delivered one to the House from the Texas legislature asking the President and Congress to do what they could to speed up the manufacture of synthetic rubber.

On the Senate side, Vice-President Wallace presented a memorial from the Idaho legislature urging that Congress give "immediate attention" to the development of synthetic rubber.

From the Iowa legislature came a resolution, presented by Sen. Gillette, urging that steps be taken by his investigating subcommittee to "unsnarl" the situation regarding production of synthetic rubber from agricultural products. The resolution asked also that the rubber manufacturing plants be located in surplus-crop areas, including Iowa.

South Dakota Sends One

A resolution from the South Dakota legislature requested Congress to legislate for production of rubber and alcohol products from agricultural and forest crops.

From the North Dagota legislature came two resolutions. One called for immediate steps to produce rubber from farm products. The other asked an immediate investigation by the Senate agricultural and forestry committee of all agricultural "musts", including sufficient farm machinery and repair parts, gasoline, and rubber.

2/3 of Aviation 'Gas' Needs Under Construction—Brown

WASHINGTON — Two-thirds of the aviation gasoline requirements of the United Nations is now under construction and WPB's authorization for the rest of it has been obtained, according to Bruce K. Brown, assistant deputy petroleum administrator, testifying Feb. 15 before a subcommittee of the House appropriations committee. Printed hearings have just been made public.

"With each 100 gal. of aviation gasoline we must have 5 gal. of lubricants, which requires new construction, and that is also being undertaken," Mr. Brown said.

Size of the aviation gasoline program was indicated by Mr. Brown when he was testifying Nov. 23 before Congressman Lea's oil investigating committee. At that time Mr. Brown said "when we have completed the execution of the presently authorized program (not the last one by any means) we shall have increased the output of this product alomost 10 fold by erection at the refineries of equipment costing about half a billion dollars."

Michael Straus . . . First Assistant Secretary of Interior

Newspapermen often ask one another why a reporter will enter government service as a press agent.

They had part of the answer last week when towering, heavyset Mike Straus was promoted from director of information to First Assistant Secretary of the Department of Interior.

Mike Straus (christened Michael Wolf Straus in 1897 in Chicago) is one of the band of top-flight newspapermen scattered through the government who help make many of the more important decisions, although they personally may not be in the public eye.

Comparatively speaking, Mike Straus has been in the background of the Department's functioning—except to those "in the know" who will tell you he is one of Secretary Ickes' closest confidants.

Indeed, some say he is closer to Mr. Ickes than any one else in the department.

If you want confirmation of that, take a look at a picture in "Mike's" office. It is a shot of Mr. Ickes, addressed to "my personal trial and error".

Duties Not Yet Outlined

The formal order setting forth Mr. Straus' new duties as First Assistant Secretary remains to be formulated, but it is proposed that he will have charge of irreplaceable resources. That means he will be the man at the top for Bureau of Mines, Geological Survey, Bituminous Coal Division, Bureau of Reclamation, Petroleum Conservation Division.

He says he will have no direct control over PAW, but will be in touch with the oil agency.

Another thing he may do is act as a funnel through which the various agencies under Mr. Ickes will be advised of decisions reached by the Secretary when he does not stop to think whether he is acting as Petroleum Administrator, Solid Fuels Coordinator, or head of the sprawling Interior Department.

The bureaus directly under Mr. Straus' control usually work on a long-term basis, but his proposed job is to see to it that they work on immediate problems—especially those on which Army and Navy want decisions, conclusions, reports, now.

Knew Ickes in Chicago

Both Mike and his boss hail from Chicago, where Mr. Ickes was an active politician with first one party and then another, and Mike was one of the city's ranking newspapermen. But they had no personal association, mostly because they were on opposite sides of the political fence.

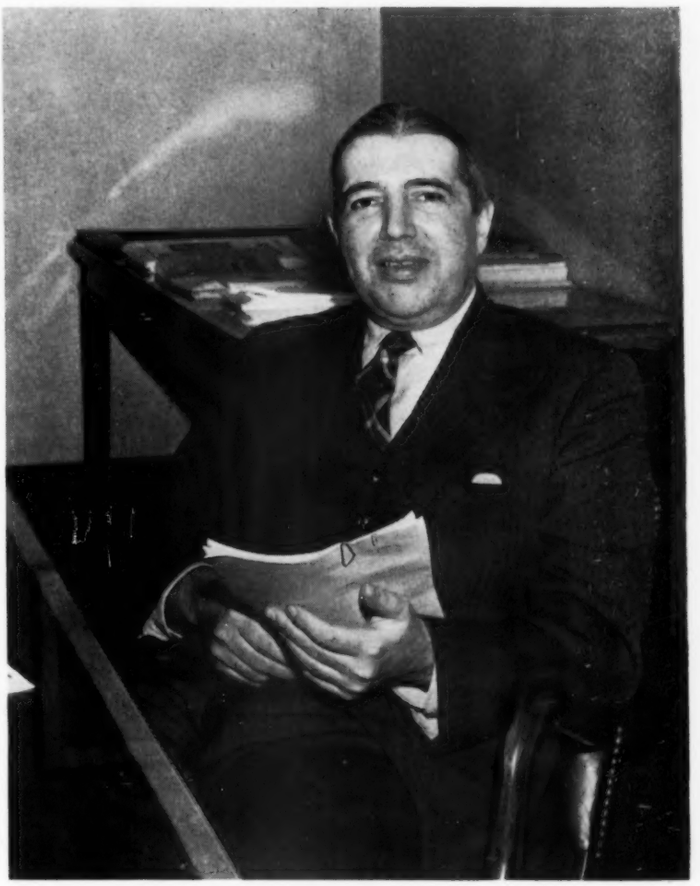
Each knew the other by reputation, however, and one day when the first hectic 100 days of the New Deal were just past, Mr. Ickes asked Mike to take over publicity for Public Works Administration. At the time, Mike was a Washington correspondent for the old Universal Service, part of the Hearst organization.

Mike took the job.

Later, he became Information Director for the Interior Department.

When America entered the war, he was placed at the head of an intra-departmenal War Resources Council.

For a time after that, he was on loan to Donald Nelson for whom he headed WPB's War Production Drive. An idea of his promotional and executive ability can be gained through realization that more than 1600 labor-management committees were formed in the drive, embracing more than 3,000,000 people.



Michael Wolf Straus

When Mr. Ickes decided Mike had done a good enough job for Mr. Nelson, he called him back to the Interior Department.

Mike's early schooling was in the suburbs of Chicago, and he started out to be a chemist, attending University of Wisconsin, but the first World War interrupted his chemical career and he joined the Navy. He became a deck officer with rank of Ensign. His love for the sea crops out in his pet avocation—deep water sailing.

Worked on Newspaper

By the time the last war was over, the smell of printer's ink was in his nostrils and he wound up on the old *Chicago Evening Post* where he was successively—except for brief interludes when he was working on somebody else's paper—a reporter, political writer, editorial writer, city editor, and managing editor.

He newspapered in Chicago during the rip-roaring days of prohibition and gangsters, and once pulled a bomb out of the mail of Federal Judge Kenesaw (Mountain) Landis.

Newspapermen around Washington understand Mike is a man of means, but Mike says they are only "minor means". His wife, who is a medical doctor, owns part of an island off the Maine coast.

True to type, Mike's favorite reading is the daily press—"a source of constant surprise and bewilderment".

Assistant Deputy PAW Allen signs first allocation of oil industry's CMP materials pool for War Emergency Pipelines, Inc. Material is for use on second leg of "Big Inch" crude pipeline to East Coast. Standing left to right, Frank Watts, PAW materials director; Frank Brinegar, PAW transportation division; and Burt E. Hull, WEP general manager

Allen Signs First Oil Industry Allocation Under CMP

WASHINGTON — Assistant deputy PAW Allen assigned to War Emergency Pipeline, Inc., the first allocation of materials taken out of the "kitty" PAW will administer for the oil industry under Controlled Materials Plan.

The material will be used on Eastern leg of the 24-in. crude pipeline from Texas to Philadelphia and New York.

Meantime, PAW officials were whipping into shape the operating instructions for the industry's participation in Controlled Materials Plan.

Participating in PAW's new plan for redistributing idle equipment within the oil industry will be made mandatory under plan now being drafted.

Plan New P-98-c

PAW is developing a brand new version of P-98-c, governing redistribution of idle equipment. The order, which will ban inventories greater than needs for 90 days, will centralize in one order the inventory limitations of priorities regulations 1 and 13, and CMP regulations 2 and 5.

Under Materials Redistribution Plan No. 2, part of the prospective P-98-c, an operator will be required to list all surplus material—new and used—of more than $5 replacement value and which would need priority assistance for replacement; also to report to PAW district offices all material valued at more than $100.

From this inventory PAW will help locate materials needed by operators.

When a company reports its material to PAW, it will be assigned a serial number.

Enforcement feature: unless a company has one of those serial numbers, it will not be able to obtain any material—new or used.

Foreign Oil Committee Announced by PAW

WASHINGTON — Formation of a Foreign Petroleum Committee composed of representatives of federal agencies having principal interest in foreign oil affairs was announced Feb. 26 by PAW.

Purpose of committee, PAW Chief Ickes said, will be to coordinate functions of various branches of government in relation to foreign oil activities. Invited to become members were: State Department; War and Navy Departments; Board of Economic Warfare; Office of Lend Lease; Office of Coordinator of Inter-American Affairs; and War Shipping Administration.

Agency Probers

House Committee Set Up to Keep War Agencies Within Legal Bounds Receives Flood of Complaints, But isn't Ready to Handle Them Yet. Seeks Lawyer

WASHINGTON — Congressman Smith's "court of appeals"—authorized by the House on Feb. 11 but not yet in operation—is receiving a flood of complaints against regulations of government agencies.

Some of the kicks are from oil companies that don't like well spacing regulations or object to orders issued by various agencies, including OPA, SEC, and U. S. Maritime Commission.

Many of the "cases", a committee spokesman pointed out to NPN, are "from people who have just been stepped on, those who don't agree with the fellow who administers the law." The committee has no authority to take up the ordinary variety of "squawks", he made clear, but welcomes information on instances where an agency has exceeded its legal authority in imposing regulations.

Cases should be sent in by mail, with the facts stated briefly, Chairman Smith says.

Committee lawyers, not yet hired, will sort the complaints and sift out the ones that come within the committee's authority to investigate. For the present, the incoming letters are merely being acknowledged.

Full organization of the committee is waiting on its selection of a counsel.

Make-Up of 'Court of Appeals' Shows Anti-New Deal Flavor

WASHINGTON — Composition of the new House 7-man "court of appeals" organized to keep federal agencies from overstepping their authority is taken as an expression of the new Congress' attitude toward the "bureaucrats" many members have been thundering against.

During the few days since adoption of the Smith resolution (H. RES. 102) creating the committee (Feb. 11) there has been a stampede of House members to be named to the "court" which promises to be the outstanding committee of this session.

The complexion of the committee is more than slightly anti-New Deal. In selecting the members, Speaker Sam Rayburn took into account the temper of the new Congress. The membership includes a good sprinkling of lawyers, two of whom served as judges before coming to the House.

Headed by Anti-New Dealer

Heading the 7-man group is Howard Smith, Virginia banker-lawyer and outspoken anti-New Deal democrat. His record includes services as commonwealth's attorney, corporation court judge, and judge of the 16th judicial circuit of Virginia.

Three members of the committee have stood with Rep. Smith at least twice in opposing the administration—Fred Hartley, republican, N. J.; Hugh Peterson, democrat, Ga.; and John

Jennings, Jr., republican, Tenn. They paired against or voted against the price control bill and voted for anti-strike legislation.

Active in Oil Probes

Rep. Hartley was a member of the Fitzgerald committee, one of the most active committees in the last Congress investigating the oil industry.

Rep. Peterson is a farmer-lawyer and considered a middle-of-the-roader in his attitude toward New Deal legislation.

Rep. Jennings is an old-time republican, a lawyer, and formerly served as judge of the 2nd chancery division of Tennessee. During the last war he was special assistant to the attorney general.

John Bennett, Michigan republican, serving his first term in the House, has been critical of the Administration's domestic policies. He is a lawyer and was prosecuting attorney of Ontonagon County 3 terms.

2 New Dealers Listed

The other 2 members can be put in the New Deal column—Jerry Voorhis, California democrat, recently resigned from the Dies committee; and John Delaney, New York Tamanyite.

Keen interest now centers in the committee's selection of a counsel. It is known that they are seeking an outstanding lawyer, something above the ordinary run of committee counsels, one that will give national weight to the committee's work.

War Agencies Show Recognition Of Automobile's Essentiality

WASHINGTON—More concrete evidence that government thinkers are regarding passenger automobiles as essential is beginning to emerge, coincident with more rumors of rationing of motor vehicle repairs.

The following developments support that conclusion.

1—ODT Director Eastman said in a Feb. 25 speech before the Wartime Conference on Employe Transportation in New York that "the best interests of the country demand that these automobiles be continued in necessary transportation."

2—OPA made more people eligible for "C" rations if "B" coupons are insufficient to get them back and forth to work.

3—An ODT source said more and more people are realizing that all motor vehicles are essential and that a line cannot be drawn—for the purpose of doling out repairs—between an essential and an unessential vehicle.

May Ration by Type

Instead, he reported, repairs may be rationed by distinguishing between an essential and an unessential repair. For instance, replacement of a transmission would be essential; straightening a bent fender might not.

All private passenger cars can now get recaps without rationing board certificates. Of course, this makes no change in mileage rationing policy except that it cuts out the red tape of getting certificates from local boards.

An important point in removal of that intermediate step in obtaining a recap, an informed source pointed out, is that a car dealer may now recap the tires on cars he holds for sale.

Ickes Wants No Part Of Rationing Job

WASHINGTON—PAW Chief Ickes is in no-wise anxious, or even willing, to take over OPA's fuel oil and gasoline rationing duties. He made it clear at his weekly press conference, Feb. 25.

Asked if he were a "candidate" for this job, he said: "I do not choose to run." After a brief pause, he said "And I mean it!"

Mr. Ickes told reporters that the eastern oil situation has "eased a bit" because of warmer weather and continued movement of substantial oil supplies into the area. But, he added, there is no immediate prospect of relaxing the "pleasure driving" ban though it might be relaxed in some local areas because of special consideration.

Compares Stocks to Pain

"Well, Mr. Secretary, since the situation is improved in the East now. . ." started one newspaperman. Mr. Ickes interrupted: "Now wait a minute, I didn't say the situation was improved. I said it had eased a bit. You might compare it to a pain . . . it might ease a little but it wouldn't mean you were improved or cured. It's the same way on the East Coast. Storage stocks are well below what the industry considers the danger point, and our first obligation is to fill those storage tanks for next winter so we can assure the people they will be warm—or at least as warm as they have been this season."

That seemed to take care of the situation in the East.

Next, P.I.W.C.'s recommendation for a 25c hike in crude price bobbed up. Mr. Ickes said PAW still had it under consideration, adding "After all, it took them (P.I.W.C.) a couple of years to work up all that data and we've only had it about 2 weeks."

Ease Ban on Heating Stove Oil

WASHINGTON—Relaxation of ban against issuing permanent fuel oil rations for heating stoves bought since last July, was announced Feb. 24 by OPA through issuance of Amendment 39 to RO 11, and Amendment 2 to RO 9—Rationing of Heating Stoves, both effective March 2.

Amendment 2 to RO 9 permits householders to buy, under certain circumstances, new oil stoves for heating essential living or working space which is not now heated, OPA said.

WPB Revises Application For Heat Exchangers

NPN News Bureau

WASHINGTON—WPB has set Revised PD-615 as the form on which prospective buyers of heat exchangers must apply for "authorization to purchase", WPB announced Feb. 24.

The new form requires complete information regarding the delivery promises made by manufacturers in order to determine definite delivery dates, WPB said, while at the same time combining the functions of two previous forms—PD-615 and PD-615A. It will also simplify the filling out of information required in the application as well as serving as an authorization form.

Meanwhile, WPB gave a review of the heat exchanger manufacture outlook. It said:

Reviews Exchanger Outlook

"Steel plate, forgings and tubes and various forms of copper and copper base alloys are the materials used in the manufacture of heat exchangers. These are all critical materials, but although the amounts needed are relatively small in proportion to the total supply of steel, specific requirements for forgings and tubes constitute a large percentage of the quantities available.

"With sufficient materials allotted for heat exchangers, WPB will make certain that the industry utilizes its facilities to the full; that it extends the use of subcontractors and that the flow of contracts is leveled off throughout the industry in accordance with productive capacity of individual plants. In short, WPB points to the scheduling program it has initiated which will treat the whole industry as one large plant, apportion the contracts to it, allot the materials needed, determine the order of deliveries, and see to it that delivery schedules once set are maintained."

Over 560-Miles-a-Month Cars To Get New 'War' Tires

WASHINGTON—So-called "war" tires for passenger cars—tires made of reclaimed rubber—which are being made in "limited quantities", have been reserved for needed replacements on cars with mileage ration of more than 560 miles monthly, OPA announced Feb. 24, with issuance of Amendment No. 13 to RO 1A, to be issued Feb. 27, effective Mar. 1.

Other changes:

Amendment provides that section of regulations under which dealers get original allotments of used tires will be withdrawn March 15. At present there are two methods—one provides for obtaining used tires alone, the other for a stock of Grade 3 tires. After March 14, only the Grade 3 provision will remain.

Permits a dealer, holding a replenishment portion (part B) of a rationing certificate calling for a tractor-type or implement-type tire, to restock with any size Grade 3 tire instead, if he wishes.

WAR ORDERS for the OIL INDUSTRY

Every care is taken each week to list every order, rule and regulation issued by any war agency and applicable to all branches of the oil industry. Since these orders are so numerous, however, we will appreciate our readers' cooperation in letting us know when they find that we have omitted a regulation.

Complete copies of the official text of every order on oil can be obtained from PLATT'S OIL-Law-GRAM, 1213 W. Third St., Cleveland, Ohio, a publication which reproduces and mails out the orders on oil immediately upon issuance. Minimum charge for single copies, $1, postage paid. One year's service, $75.

Code: AO—Administrative order; RO—Ration order; L—Limitation order; M—Conservation order; P—Preference rating order; PS—Price schedule; RPS—Revised price schedule; MPR—Maximum price regulation; GMPR—General maximum price regulation; Supp.—Supplementary; Reg.—Regulation; GO—General order.

The Week's Orders

(Issued from Feb. 20-27, Inclusive)

PAW—Petroleum Administration for War
- PAO 8—Drilling, Barnhart Field
- PAO 9—Natural gas wells

PR—Prices
- 28—Ethyl alcohol
- 88—Anti-freeze, Am. 77
  - Diesel oils, Am. 75
  - Distillates, Am. 74
  - Lube oils, industrial, Am. 69
  - Pipelines, Am. 76
- 137—Anti-freeze, Am. 24
- GMPR—Barge rates, Sr 14, Am. 118

RO—Ration Orders
- 1A—Tires, Am. 12, 13, 14
- 5C—Gasoline, Am. 24, 25, 26
- 9—Heating stoves, Am. 2
- 11—Fuel oil, Am. 39, AE 1

L Orders
- L-41—Construction equipment
- L-272—Control valves

M Orders
- M-81—Cans

P Orders
- P-140—Wooden, fibre shipping containers

Priorities Regulations
- 11—Operating supplies

WMC—War Manpower Commission
- R 3—Workweek

ODT—Office of Defense Transportation
- GO 3—Speed limit
- GO 6—Speed limit
- GO 17—Speed limit
- GO 21—Speed limit
- GO 23—Speed limit

Digest of Week's War-Oil Orders

PAW—Petroleum Administration for War

DRILLING—PAO 8—Drilling in Barnhart Field, Reagan County, Tex. restricted to 1 well per 160 acres; issued and effective 2/20.

PAO 9—Materials denied for new drilling of or additions to natural gas wells in Carson, Collingsworth, Gray, Hansford, Harley, Hutchinson, Moore, Potter, Sherman and Wheeler Counties, Tex.; issued and effective 2/23.

OPA—Office of Price Administration

ANTI-FREEZE—RPS 88, Am. 77—Prices for substitutes extended indefinitely; issued 2/26, effective 3/4.

MPR 137, Am. 24—Retail substitute prices continued indefinitely; issued 2/26, effective 3/4.

BARGE RATES—SR 14, 118, GMPR—Specific rates set for towing or tugs and barges for distances over 150 miles along Gulf Intracoastal Waterway; issued and effective 2/19.

DIESEL OILS—RPS 88, Am. 75—Specific prices set for Diesel oil of 28° A. P. I. gravity and above at Mobile, Pensacola, Port St. Joe and Panama City; issued 2/23, effective 3/1.

DISTILLATES—RPS 88, Am. 74—Specific ceilings set for kerosine, No. 1 fuel oil and range oil in New York City and surrounding counties of Westchester, Suffolk and Nassau; issued and effective 2/22.

ETHYL ALCOHOL—MPR 28—New prices set up (excluding west coast ethyl alcohol); issued 2/22, effective 2/27.

FUEL OIL RATIONING—RO 11, AE 1—Extra rations granted for schools where registration for War Ration Book 2 was held; Administrative Exception Order 1 under RO 11; issued and effective 2/22.

Am. 39—Rations granted on permanent basis for heating stoves; issued 2/24, effective 3/2.

GASOLINE RATIONING—RO 5C, Am. 24—Coupons without proper identifying notations on back, but which were received by Nov. 30, can be redeemed at board by dealers or distributor through March 11; issued 2/23, effective 3/1.

Am. 25—Renewal by mail provided for T rations; ration periods for farmers extended to 6 months; issued 2/24, effective 3/2.

Am. 26—Third period A coupons may be deposited through March 20; issued 2/27, effective 3/5.

HEATING STOVES—RO 9, Am. 2—Restrictions on purchase of new oil heating stoves relaxed (and permanent rations granted—see above); issued 2/24, effective 3/2.

LUBE OILS, INDUSTRIAL—RPS 88, Am. 69—Pricing methods set up for industrial lubricating oils and greases; issued 2/19, effective 2/25.

PIPELINES—RPS 88, Am. 76; SR 1, Am. 53, GMPR—Crude sent through "Big Inch" line exempt from price control; issued and effective 2/19.

TIRE RATIONING—RO 1A, Am. 12—Recapping with passenger-type camelback permitted without authorization of board; issued 2/19, effective 2/20.

Am. 13—Tires made of reclaimed rubber to be classified as Grade II, leaving only used tires in Grade III classification; issued 2/27, effective 3/1.

Am. 14—Revised Tire Rationing Regulations to remain in effect in Territories and possessions, instead of RO 1A; issued 2/27, effective 3/1.

WPB—War Production Board

ANHYDROUS ALUMINUM CHLORIDE—M-287—Use or deliveries of more than 50 lbs. per month require WPB authorization after March 15; issued 2/20, effective 3/15.

CONSTRUCTION EQUIPMENT — L-41 — Restrictions on building clarified; L-41 as amended Feb. 19.

CONTAINERS—M-81, Am. 1—Electrolytic waste-waste classified as blackplate and excluded from definition of tinplate; issued 2/18.

M-81, Interpretation 1—Frozen tinplate, terneplate and blackplate defined as plate held in manufacturer's inventory since before Dec. 9, 1942; issued 2/22.

P-140—Preference ratings assigned on wooden or fibre shipping containers, with lube oils and greases given AA-3 and petroleum products AA-4; issued 2/24.

CONTROL VALVES—L-272—Restrictions set up on manufacture and sale; issued 2/22.

OPERATING SUPPLIES—PR 11—Definition enlarged to include fabricated containers, paper products, fuel or electric power, safety equipment and clothing, production material and materials for plant expansion; Prior Reg. 11 as amended Feb. 20.

WMC—War Manpower Commission

WORKWEEK—R 3—Policy established on application of 48-hour workweek; issued 2/22.

ODT—Office of Defense Transportation

SPEED LIMIT—Trucks making governmental deliveries exempt from 35-mile speed limit; General Permit 3 Revised-7, General Permit 6-10, General Permit 17-20, Exemption Order 23-2; issued 2/20, effective 3/1.

Vehicles used for testing lubricants, tires, etc. also exempt from speed limit; Exemption Order 21-6, 23-1A and Revocation of General Permit 6-10; issued 2/27, effective 3/1.

WPB Suspends Dealer

WASHINGTON—Directed by WPB against two Washington, D. C., gasoline dealers on Feb. 27 was Suspension Order S-247 for allegedly delivering 550,295 gal. of gasoline in excess of the amounts permitted by L-70 to 11 service stations owned and operated by them.

The suspension order, effective for 6 months, prohibits delivery of any motor fuel to the company's 12 stations.

ODT Issues Certificates To Cover Extra Cost Of In-Transit Handling

NPN News Bureau

WASHINGTON—ODT has issued following statement March 4, on in-transit handling of oil shipment to East Coast:

The Office of Defense Transportation has begun Certificates of Request for In-Transit-Handling to petroleum companies and others eligible for compensatory adjustments covering special wartime costs of moving petroleum and petroleum products into District 1 by substitute methods, it was announced today.

The certificates of request are issued under Regulation No. 1 of Defense Supplies Corporation, Amendment No. 1, which provides, in part:

"If In-Transit-Handling is incurred by applicant under the Substitute Method of Transportation on or after January 1, 1943, then the Normal Cost of In-Transit-Handling shall be deducted from the applicant's claim and the Substitute Cost of In-Transit-Handling may be included in such applicant's claim, provided such In-Transit-Handling was incurred pursuant to the prior written request of the Office of Defense Transportation.

"If In-Transit-Handling is or has been incurred by an applicant under the Substitute Method of Transportation prior to January 1, 1943, then the Normal Cost of In-Transit-Handling shall be deducted from the applicant's Claim and the Substitute Cost of In-Transit-Handling included by such applicant in his application filed hereunder, provided such In-Transit-Handling was incurred pursuant to the request of the Office of Defense Transportation or the Office of the Petroleum Coordinator for War (Now Petroleum Administration for War) and the inclusion thereof is approved by the Office of Defense Transportation."

Persons eligible to apply for petroleum adjustments have been defined by DSC as follows:

"A person who produces, manufactures, acquires or purchases Crude or Compensable Products in Districts Two or Three and imports the same, by Substitute Methods of Transportation, for manufacture or sale within District One, or who makes a Compensable Intra-District Movement . . ." or "any person who, during the twelve-month period ending June 30, 1941, regularly imported Compensable Products from Districts Two or Three for his own consumption in District One."

Application forms for the certificates are available at the office of Fayette B. Dow, Room 5128 Interstate Commerce Building, Washington, D. C. All communications concerning the certification should be sent to that address.

High Preference Ratings Set On Container Deliveries

NPN News Bureau

WASHINGTON—In a new order—P-140—issued Feb. 24 by WPB to "assure adequate distribution of shipping containers for the packing of military and civilian products", producers and shippers of military combat equipment, lend-lease materials, foods, and other essential items, including petroleum products, were assigned high preference ratings for procurement of shipping containers.

A preference rating of AA-4 was assigned to petroleum products shipping containers. Order covers all outer wooden containers made from lumber, veneer, plywood, or staves, and outer shipping containers made from corrugated or solid fiber, etc.

The EDITOR'S Page

Readers comments and opinions will be much appreciated by—WARREN C. PLATT, NPN's Editor and publisher, Penton Building, Cleveland, O.

Let ALL Plan Next Year's Fuel Oil Rules Then ALL Will Help Make Them Work

FUTURE programs for getting owners of heating equipment to convert from oil to coal should be developed as cooperative, democratic movements and should not be handed down from Washington as decrees of dictatorship.

Fuel Oil Rationer Dean of OPA is now writing members of Congress asking suggestions for next winter's conversion and rationing programs. We trust he is going to consult the oil industry generally also and keep on consulting it until the job is done. This is in direct contrast to his method of last fall when the program was cooked up in considerable secrecy, presented in "secret" to a few score oil men, and then came to grief because the public just did not have faith in it; which means the public did not have faith in the people who undertook to hand it down to them.

PAW Marketing Director Collier, before a Senate investigating committee the other day, complained that the conversion program for this winter failed because, as he put it, "the press has been against it". He later modified this statement.

What sank the conversion program and what has sunk most all programs that are dependent on public cooperation is the faultiness of the program and the disrepute in which Washington bureaucracy is held. Even business men, recently come from the homes of the "common people", get so buried in the detail of Washington that they forget the disrepute with which Washington is held by those back home.

All the newspapers have done is to reflect the feelings of the average man. That average man has seen a constant changing of minds at Washington, continuing erroneous decisions that showed a great ignorance of the facts and an arbitrary, high-handed attitude toward the public of "take it and like it". This, Washington bureaucrats do not seem to understand, Americans do not have to stand for.

The lack of confidence in what comes from Washington is so great that even meritorious plans made by able and fair minded officials suffer.

The only possible way to overcome this general suspicion and doubt of Washington by the public is to let the public have more of a hand in devising its own regulations. Let the public select who will represent it on various committees, let the public have opportunity to discuss proposed measures, let the public finally determine what it wants to do.

LAST summer OPA Rationer Dean, we believe, picked himself a committee of reputable men, representing some organizations interested in fuel oil consumption. But, so far as we could find out, OPA did the picking and not these organizations, and OPA kept the deliberations secret and even threw an NPN man out of the alleged "public" meeting when the fuel oil regulations were presented to a picked group of oil men "in secret".

For the coming winter, let all organizations interested in fuel oil distribution and consumption select their own representatives for a joint committee. Let each representative not only be free to talk to his people but let him be instructed to talk to them, to all others interested and to the general public whenever he has anything he thinks is worthwhile saying. Let each representative be allowed to use his own judgment and not be under censorship of OPA or a committee chairman.

For the oil industry, let PAW be the main point of contact. It seems to have been deliberately ignored last summer and fall. But let PAW and all its interested committees be told that they must waive all their present rules and conceptions of restricting public discussion and of letting committee members speak only when a top chairman has given express permission. So manage the drafting of next season's regulations that every last oil man, big and little, will feel that he has had a real part in getting up those regulations right from the beginning and that they are HIS regulations as much as they are anybody else's. If every oil man feels that way then each will understand the regulations, each will believe in them and each will go out and make them work.

To get these rules accepted and believed in, let governors and mayors and chambers of commerce appoint representatives to committees and see that those representatives report back to their constituents.

Petroleum Administrator Ickes and the new OPA chief, Prentiss Brown, should be able quickly to lay down the general plan for such a peoples' joint effort to save fuel oil for next season and to see that the plan is carried out.

A peoples' plan will work, but another bureaucratic and professorial one will flop just as it did this winter.

Pure Figures High Cost Of Government Reports

IF EVERY company could and would go to the trouble and expense of figuring its costs in making up government reports of all kinds, especially the reports that seem useless, headway could be made in reducing their number. A growing group in Congress is delving into this evil but it needs dollars and cents facts like those presented by President Dawes in the annual report of the Pure Oil Co.

Mr. Dawes estimated that making up this "mass of uncoordinated, immaterial and irrelevant data" cost his company in 1942 between 8% and 10% of its net earnings or between $1,000,000 and $1,500,000.

Perhaps if every company could make an estimate of this needless governmental red-tape cost and then attach a note to every reply to government questionnaire and report, saying:

> "It has taken ——— number of hours of ——— number of people to gather this data and make up this report to you. Last year it cost us $—— dollars to make up similar reports for all governmental agencies. This is hard money that we have to collect from our customers and also take from the pockets of our stockholders.
>
> "We hope you appreciate all this and that you see that you get OUR MONEY'S WORTH out of this report."

Industry should not hesitate to educate its representatives whenever possible. Otherwise they will only get worse. But, if these facts can be compiled, as President Dawes has done, the representation will improve.

Oil Supply for War Now Squarely up to OPA

THE change in chiefs of OPA seems to be bringing about what may well be called an Americanization of that outfit.

It is now asking advice of oil men and of senators and representatives as to future plans, something which heretofore was among the most secret of secrets until

sprung on an unsuspecting and much suffering public.

OPA also seems to be changing its arbitrary policy on prices, that, come what may, there shall be no recognition of higher costs and no stimulating of increased supply by higher prices.

The new chief has not yet done much housecleaning but the prospect of such an event seems to have made some persons a bit more understanding of the rights of American citizens and the principles of free and competitive business enterprises that have built this country.

More and more this war is becoming a problem in supply of materials. OPA, as the chief price-fixer, therefore has the responsibility of providing the supplies. Oil is one of those war materials whose supply at needed points is not sufficient. Oil prices that decently cover costs, rather than prices that reduce operating units in oil, are now demanded for the proper prosecution of the war.

Sufficient oil for a winning of the war is now the problem squarely up to this improving OPA. For the sake of the country, may it act promptly.

Red Tape Costs Pure Oil 8-10% of Net Earnings

NPN News Bureau

CHICAGO—Answering government and industry committee questionnaires and compiling "the mass of uncoordinated, immaterial and irrelevant data" required is currently costing Pure Oil Co. an amount equal to between 8% and 10% of the company's net earnings, Henry M. Dawes, president, said in a letter to stockholders accompanying Pure's annual report for 1942.

Net earnings for 1942 were $13,761,826 compared with $15,285,255 for 1941.

Mr. Dawes also said government policies affecting producing equipment and prices of crude oil and products are seriously threatening the maintenance of war oil supplies. He deplored the "constant agitation by the Treasury Department" to eliminate or reduce the depletion allowance.

At present, Pure Oil is installing new facilities costing $12,000,000 to supply required war products, Mr. Dawes disclosed. Construction costs have been paid out of current funds without recourse to government borrowing and without "the necessity of the government's building or owning any equipment on government property," he added.

New York 'Gas' Sales Off 36%

Special to NPN

ALBANY — Gasoline rationing accounted for a 36% decline in taxable motor fuel sales in New York during December, when gallonage fell to 95,269,387 from 149,709,492 gal. in December, 1941, according to the State Tax Commission.

Taxed gasoline sales in 1942 totaled 1,426,298,861 gal., against 1,898,480,705 gal. in 1941, a decline of 25%. Total consumption, non-taxable sales included, was off 54,112,113 gal. in December, to 110,951,145 gal., and declined 462,976,480 gal. during the entire year, to 1,595,094,293 gal.

An Appeal to Byrnes . . .

Their Backs to the Wall, Berks County (Pa.) Dealers Urge Economic Stabilizer Byrnes To Answer on Their Earlier Price Advance Appeal

Hon. James F. Byrnes,
Office of Economic Stabilization,
Washington, D. C.

Feb. 23, 1943

Dear Judge:

Many of our forefathers fought for freedom during the Revolution, and our grandparents in the Civil War.

Most of us were in the World War, but today we are too old to fight in this war.

We have our convictions of what is wrong and what is right, and for these principles we will continue to fight, buy bonds to our limit and encourage our children who are fighting in combat duty on all fronts.

We are helping to win this war, but there is only one line of endeavor in which we can personally contribute. That endeavor is the oil business, due to our age and years of specialized training as oil dealers.

We cannot do our part in winning this war if we do not have any ammunition, any more than our fighting men can do if they are not properly equipped or run out of ammunition.

We oil men in Berks County forwarded to you a copy of our letter to Mr. George Doffing of the OPA on January 23rd, of which we are enclosing a copy. We have every reason to believe that our modest request would be granted and have waited patiently, expecting that any day we would receive help of 1⅜c per gallon.

Saturday we received from OPA a copy of Robert H. Collacott's address before the Illinois Petroleum Marketers Association. We have studied Mr. Collacott's scholarly thesis, the theme of which is that we must hold down inflation and we agree with him that we should do so within practical limits. Making a fetish of holding down inflation can impede the war effort if carried too far.

We oil dealers in Berks County are not big business; we are not even little business. Today we are labor, pure unadulterated labor. We are so low that we are working 12 hours per day, for we don't know what else to do to keep the wolf from the door. We are good at keeping cars running, but we would be misfits in war factories. We are labor, but we are not being paid for our labor, and if we don't get an increase soon, we will be bankrupt. We are being deflated rapidly and yet all around us we hear talk of the fear of inflation. Are we to become the forgotten men? Not if we can help it.

Now let us consider the car owner. For example take an "A" book holder. His coupons are worth 3 gallons each. He can have a maximum of 144 gallons per year. Our experience since the pleasure driving ban has been that at the present rate he is only using about one half of his coupons or 72 gallons per year.

If we oil dealers are allowed an increase of 1 cent for the retailer and ⅜c per gallon for the jobber, it would increase the car owner's maximum cost $1.98 per year. If the ban on pleasure driving continues it will cost him a mere 99c per year. This 99c is an insignifi cant amount, compared to the increased earnings of the majority of workers, but that 99c, to us, means on the average of about $50.00 per month, which will go a long way toward helping us pay our taxes, rent and grocery bills. Further, it will encourage us to keep struggling.

Judge Byrnes, we dealers and jobbers in Berks County are just as patriotic as anybody, and we are telling you that the fellows that have stuck to the gas business up to the present time, have done so because they are not fitted to do any other work. The men who were fitted to do war work have now left the service station field. Before we go entirely bankrupt we will fight for our lives. We have but three choices:

1st. A raise in margins, granted by OPA or by you, but bear in mind that margins mean wages, pay, not profits.

2nd. A raise in margins which we undertake ourselves in violation of OPA regulations.

3rd. Strike-closing all stations in the area.

The latter two things we do not want to do—We urge you to grant us the first.

Now Judge, we are fighting men, good old Pennsylvania Dutch stock. We are standing with our back to the wall; we have retreated as far as we can go, we are making our last stand, so don't force us to violate the law or bring about a strike but God we will strike if we have no other recourse. So give us the ammunition and permit us to continue to live like fighting men doing our part to knock hell out of Hitler and the Japs.

This is an expression of the sentiments of all the dealers in Berks County, and if there is anything more you would like to know about our dilemma, and there are many things about our work which we cannot explain in a few words, we will be glad to come to Washington if you will favor us with a hearing.

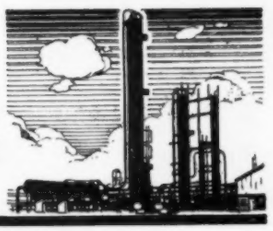
We look forward to receiving a personal reply.

Very truly yours,

PETROLEUM RETAILER'S ASSOC.
OF BERKS COUNTY

(S.) Charles F. Schoenley, Secretary

752 N. 13th St.
Reading, Pa.



Refinery Yields

Agitation Grows on Capitol Hill for Legislation To Compensate Refiners for Making More Fuel Oil, Less Gasoline. Maloney Committee Adds Voice

NPN Staff Special

WASHINGTON—Sen. Maloney's gasoline and fuel oil investigating committee has added its voice to the growing demand on Capitol Hill for legislation to bring refiners compensation for changed yields—more fuel oil, less gasoline.

In the report of its hearings issued Feb. 22, the committee said that "much of the hardship being suffered by fuel oil consumers resulted from a price structure which discouraged the production, transportation, and accumulation of fuel oil in the places where it was most seriously needed."

The report pointed out that it was more profitable to produce and to sell gasoline than fuel oil, and selling prices of both products were fixed at levels which discouraged dealers from accumulating stocks.

"Prices in the areas with the greatest demand," the report said, "were lower than those in areas where the need was not as great, resulting in a tendency to ship less to the place where the shipment would be less profitable."

Clark Committee Favors

From Sen. Clark's mid-western fuels committee came all-but-definite commitments by members that legislation would be forthcoming.

The committee wants more fuel oil for the mid-western shortage areas, and the method of getting it appears to be narrowing down to changed yield compensation, in the opinion of members.

Sen. Clark's committeemen also are thinking of legislation to bring about a boost in crude prices, which, coupled with compensation for refinery conversion, they believe, would bring more fuel oil.

Both subjects bobbed up repeatedly during the 3-day hearing of the Clark committee Feb. 16, 18 and 19. Members expressed chagrin that no program of compensating refiners has been worked out by PAW and OPA. Sen. Reed, Mo., said he had expected to find such a program ready to go into effect when the committee returned to Washington from its field hearings early in February. He told PAW witnesses of his disappointment at finding "nothing has been done".

Won't Let It Die

Sen. Reed told NPN after the hearing that the committee was not going to let the matter rest there; that it was going deeper into compensatory adjustment for refiners and into the need for higher crude prices to stimulate production.

Lack of coordination between the various government agencies in tackling the fuel problem of the Mid-West is galling committee members. Both Sens. Clark and Reed have indicated a bill may be forthcoming to set up an over-all authority to direct the activities of the fuel agencies into a balanced program.

May Call Tri-State Conference

Sen. Reed indicated that the committee's recommendations would go "beyond the ordinary functions of a Congressional committee." Among these will probably be the early calling of a tri-state conference—Kansas, Missouri, Oklahoma—of state and federal administrators to coordinate use and supplies of natural gas, fuel oil and coal in shortage areas.

Sen. Reed believes natural gas offers earliest and readiest possibilities of relieving fuel shortages.

He favors construction of a pipeline from Hugoton field to high consuming centers or as a feeder for existing pipelines.

Legislation to this end is a strong possibility.

Texas City Butadiene Plant Stopped by WPB Order

NPN News Bureau

WASHINGTON — Construction of facilities for production of butadiene at a Texas City, Tex., refinery conversion plant has been ordered stopped, WPB announced Feb. 26 (*see NPN Feb.* 10, *p.* 14). Preference ratings issued to Pan American Refining Corp. Dec. 14 last were revoked on recommendation of PAW, WPB said.

"The action," WPB added, "represents one of the first steps in revising the program for the construction of synthetic rubber facilities to conform to the reduced synthetic rubber program."

The project would have cost $1,500,000.

Girls Serve As Refinery Escorts

Because of the manpower shortage, girls have taken over jobs as escorts at the Bayway (N. J.) refinery of Standard Oil Co. of New Jersey. They meet visitors and trucks at the gate and accompany them to their ultimate destinations, seeing, as a wartime precaution, that they mind their own business

New 48-Hour Work Week May Aid Refiners; Rubber May Rob Them

NPN News Bureau

WASHINGTON—PAW expects the 48-hour work week to ease many of the manpower headaches for refiners of high octane gasoline.

This is an increase of about 20% over the 38-hour week refineries generally have been running on and officials expect this will allow the refineries to spread their manpower to take care of additional facilities.

PAW has as yet not felt obliged to work out a training program for supplying refiners with operating crews. Officials admit, however, that such a program may be necessary. For the time being, PAW is looking to the companies to do their own training of personnel.

The main rub in the situation comes from the prospective manpower requirements of the synthetic rubber plants as that program progresses. The big new plants will not be expected to go on a 48-hour week as soon as they begin operation, but gradually work into it.

Rubber Causes Concern

How far rubber Director Jeffers will "raid" other branches of the oil industry to man the synthetic rubber plants causes officials much concern. The new rubber plants will have no salary scale history to keep them down to the present levels in the oil industry.

PAW officials indicated that it might be necessary to ask that wages be frozen to prevent workers from being tempted away from other petroleum employment. For the time being it is expected that the big oil companies will be able to look after their increased requirements for manpower, by shifting personnel around. Smaller companies that are expanding, however, may have to call on PAW for some help in locating workers.

According to estimates of the U. S. Employment Service, about 18,450 workers of all kinds will have to be recruited for the synthetic rubber program.

Some of the big companies already are using women in the operational crews and it is expected that this practice can be more widely used.

Dismantling 35% Completed

NPN News Bureau

LOS ANGELES — Dismantling of the Douglas Oil and Refining Co.'s plant here is about 35% completed, stockholders have been informed. The plant, which has been sold to Russia under Lend-Lease, is being dismantled under the supervision of Russian engineers.

Gary Describes Switch To 'Cat' Cracking In W.P.R.A. Address

NPN News Bureau

TULSA — Advantages to small refiners with thermal cracking plants of the so-called "suspensoid" catalytic method for making high-octane aviation gasoline were explained by Wright W. Gary, formerly OPC (now PAW) director of refining, now president of Fitrol Corp., refinery engineers, Los Angeles, before a special meeting for refiners here Feb. 26, sponsored by the Western Petroleum Refiners Assn.

Conversion of present idle thermal cracking equipment to the "suspensoid" process is relatively simple, said Mr. Gary, entailing injection of a catalyst slurry into the feed and subsequent recovery through filtration and revivification. Prime requisites of a catalyst for this use, he stated, are these: It must be economically reclaimable, of low cost and with high activity.

Must Use Clean Gas Oil

In a brief description of this application of catalytic cracking to existing equipment, Mr. Gary said it was intended for a clean gas oil as a charging stock, that a black oil would not do because of the contamination of the catalyst. High sulfur-bearing feed stock also cannot be used.

The catalyst is made into a slurry with some of the raw feed stock, is injected on the discharge side of the feed pump, recovered by filtration from the tar (much as lime now is recovered) washed, and regenerated in a furnace such as the Harshaw type. Catalyst loss, it was stated, would be not more than 20% provided care is taken in the burning. Process requirements were of the order of 10 lbs. of catalyst per barrel of charge stock.

The operation should be carried out at a temperature about 50 deg. below that of the thermal process, or in the neighborhood of 925-950 F. Pressures are moderate, around 200-250 lbs. gage. No soaker is necessary, preferably there should be none to avoid the tendency to produce excessive tar.

Yields were said to be such as to permit a product cost in the neighborhood of 10c per gal. for an aviation type fuel. The gasoline produced now from commercial operation of this method is said to be in the high 70's unleaded, with 80 octane gasoline a possibility as more experience is developed. Lead susceptibility is said to be about half way between that of thermal and catalytically produced gasoline. The fuel oil which is a product of the operation is said to be clean with no unusual characteristics; the same applies to the tar, which should have a gravity of 12-13 A.P.I.

Gary Answers Questions

In answering questions as to specific details of the "suspensoid" process, Mr. Gary brought out:

Minimum economic size of plant adaptable to the process cannot be set now because of too much variation in such factors as location, type of cracking stock, and available markets, among others. The economic limit in size of plant has been cut in half in the last 18 months and further research will likely further lower this limit.

The process will work with either natural or synthetic catalysts. While great improvement has been made in the types of catalysts available to refiners, work is constantly being done by their suppliers to secure catalysts which would make more of the unsaturated gases such as C_4; would have greater activity, ease of recovery, and of revivification.

Ease of filtration is in direct ratio to the activity of the catalyst, it was said, although the reason for this is not known.

How wide a variety of charging stocks can be used is not yet known and need for further investigation is indicated. Perhaps a coke still distillate can be used, it is said.

Lime, to reduce corrosion in equipment when high sulfur stock is charged, cannot be used because it contaminates the catalyst.

Corrosion Negligible

There is no appreciable corrosion of equipment, but there may be a small amount of erosion, due to a scouring effect of the catalyst.

Price of the catalyst is expected to reach to to 3c per lb. through mass production methods and continuing research.

In his talk Mr. Gary traced the history of the rapidly increasing demand for 100-octane aviation gasoline, with the resulting greater demand for catalytically cracked materials. He predicted that the great part of the post-war demand would be for fuels now considered of the aviation type.

"The new automobiles will require aviation-type fuels," said Mr. Gary. "We will also have world wide air freight in addition to other use of airplanes. Tomorrow's refinery will certainly be in the chemicals field—it is today as far as aviation gasoline is concerned, as it is primarily a catalytically-produced chemical product. Refiners should keep their eyes on synthetic rubber, aviation gasoline and plastics—there are many opportunities along those lines." C. L. Henderson, Vickers Petroleum Co., Wichita, Kans., presided at the meeting.

California Standard Wins 'E'

NPN News Bureau

LOS ANGELES—For "outstanding production of war material", the Richmond, Calif., refinery of the Standard Oil Co. of Calif. was presented the Army-Navy "E" Feb. 19. Presentation was made by Vice-Admiral John W. Greenslade, commandant of the 12th Naval District, to H. D. Collier, California Standard's president.

Silver pins were later presented by Col. Milton O. Boone to Miss Blanche Lydicksen and Ira E. Bonham, representing the employes.

A special message was delivered by Comndr. W. C. Latrobe, Navy's Bureau of Ships, Washington.

Over 20 Plants to Use Hydrofluoric Process

NPN News Bureau

CHICAGO — More than 20 plants now are in operation or being constructed or designed to operate the Universal Oil Products Co.'s anhydrous hydrofluoric acid alkylation process to produce components for 100-octane aviation gasoline, the company announces. Capacity of the plants is not given.

One advantage claimed for the hydrofluoric acid process is that with this catalyst, the hydrocarbon compounds propylene and pentylene, as well as butylene, recovered from refinery and natural gases, can be used as the olefin compound to alkylate with isobutane, the paraffin in the reaction.

The availability of propylenes would more than double the potential supply in this country of olefin compounds for alkylate for aviation gasoline, it is stated. The volume of propylene potentially available from catalytic dehydrogenation and cracked gas was estimated in 1939 by Dr. Gustav Egloff, of Universal, at 290,500,000,000 cu. ft. annually, while the supply of butylene from the same sources was placed at 148,800,000,000 cu. ft. Natural gas is also a large potential source of propane, from which propylene is recovered by dehydrogenation.

Other advantages claimed for the use of anhydrous hydrofluoric acid as the catalyst in the alkylation reaction is that the yield of alkylate per pound of acid used is higher than with sulfuric acid, that the reaction can be carried out at room temperatures thus making refrigeration unnecessary, and that the hydrofluoric acid is easily recovered and reused. Patent on the hydrofluoric acid process was issued to Universal Oil Products Co. Dec. 30, 1941.

'E' Awarded to 'Esso' Lab

Special to NPN

BAYWAY, N. J.—First Army-Navy "E" to be awarded an oil company technical organization went to Standard Oil Development Co., Esso Laboratories, here Feb. 22 "in recognition of important technical achievements of the research, development and engineering staffs of the company in aid of the war." Improved chemical warfare weapons, still military secrets, and essential processes and plant designs for making synthetic toluol from petroleum and for production of 100-octane aviation gasoline are among the most important of those achievements, the company said.

Correction

Because of a linotype error, the largest butadiene plant yet in production (*NPN Feb. 24, p. 18*) was reported as being operated by Standard Oil Co. of Indiana, and this company was thus called an affiliate of New Jersey Standard. Apologies. The plant is operated by Standard of Louisiana, a Jersey Standard affiliate. Indiana Standard is not affiliated with the Jersey company.

Autocar .. MODEL 1943

The crushing fire-power of Autocar Half-Tracks has already written itself into the history of World War II and been cabled from the fighting fronts. They can take it and dish it out and roll ahead for more. And while they fight, we work that much harder to produce them . . . them and the other special-purpose vehicles for the Army, the Navy, and the Air Forces.

As Autocar Half-Tracks and transport vehicles are teaching the enemy that they mean business, so are they teaching the workers of Autocar how to make stronger, longer-lived, more precise, more economical, and more profitable Autocar *Trucks* in the warless days to come. . . . Remember Autocar. Remember your pledge to the U. S. Truck Conservation Corps. Remember that war has first call.

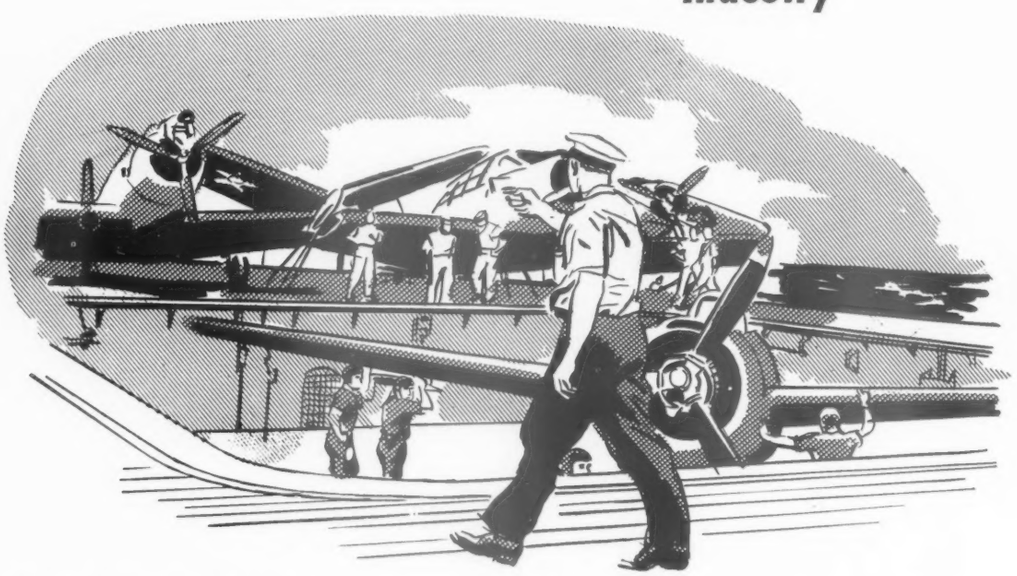
AUTOCAR

Manufactured in Ardmore, Pa.
Serviced by
Factory Branches from Coast to Coast

ARMY E NAVY

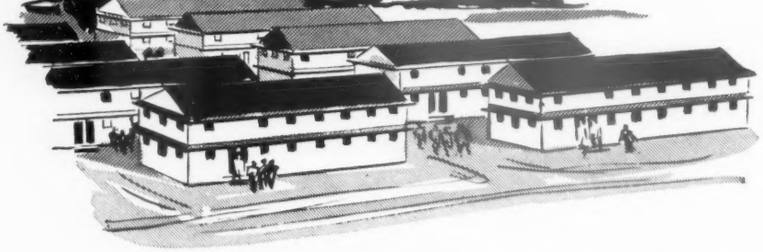
AWARDED AUGUST 1, 1942
"FOR EXCELLENCE OF PRODUCTION"

AXIS NIGHTMARE: The American Petroleum Industry



★ ***ONE RARELY THINKS OF WIRE ROPE*** as a material requiring much care, yet without proper lubrication it would be rendered unfit for use in a very short time. To lengthen the life of wire rope in its many applications, the oil industry has developed proper greases which today are helping our armed forces on the war front and our production plants on the home front.

★ ***OIL KEEPS HIM ON THE FIRING LINE*** — Yes, oil plays a part even in the life of an infantryman. To keep his rifle firing, light lubricants with extraordinary properties that reduce gumming to an almost unknown degree have been developed and methods of application have been devised.

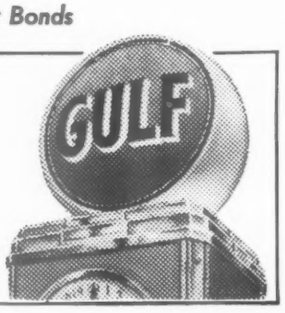


★ ***IN ORDER TO KEEP OUT OF THE WIND*** and the rain, tar-impregnated building and roofing papers are used extensively in the construction of Army barracks and defense homes. In addition, great quantities of waterproofing materials which are by-products of oil refineries are consumed yearly by the Navy.

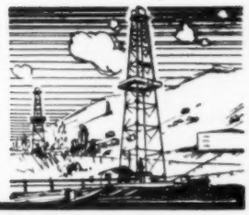
For more Bombs, Bombers, and Bombardiers...buy more U. S. War Bonds

GULF OIL CORPORATION
GULF REFINING COMPANY

The American petroleum industry has undertaken—and is performing—huge tasks of immense importance to our war effort. Gulf takes deep pride in its privilege of serving in these accomplishments.



PRODUCTION NEWS



Added Reserves

Total of 1,878,976,000 Barrels Were Added to U. S. Reserves by Extensions and New Discoveries in 1942, A.P.I.'s Committee on Petroleum Reserves Says

NPN News Bureau

NEW YORK—New oil reserves found by the petroleum industry in 1942 totaled 1,878,976,000 bbls., or 493,497,000 bbls. more than the 1,385,479,000 bbls. of crude oil produced during the year, American Petroleum Institute's committee on petroleum reserves announced in its report to the A.P.I. board of directors Feb. 27.

Net increase raised the total known underground reserves of petroleum as of Dec. 31, 1942, to 20,082,793,000 bbls. against total reserves on Dec. 31, 1941, of 19,589,296,000 bbls.

Most of the new oil was added through upward revisions of reserves in fields found prior to 1942. Further development of these older fields revealed a net addition of 1,618,925,000 bbls. of crude oil which had not been included in previous estimates but which is now indicated by additional development information, the report stated.

Figures in the report include all grades of crude oil and condensate known to be recoverable under existing economic and operating conditions, but they do not include any estimate of the reserves which may be found in areas known to be favorable to the accumulation of oil but which are as yet untested, the committee said.

Availability Not Reflected

The committee stressed the fact that its estimates of proved reserves do not reflect availability or rate at which these reserves can be produced with or without physical waste.

"For instance, arbitrary division of the known reserves by a current rate of production or by any anticipated rate of consumption is obviously incorrect. Oil in the ground cannot be produced at any desired rate for a given period of time. As a matter of fact, today's known oil can be recovered only over a period of many years and at gradually declining annual rates, as has been widely demonstrated by past performance under all kinds of operating conditions."

Report emphasized further that estimates referred only to reserves proved by drilling and production performance, pointing out that in the case of a new discovery, where only a few wells have been completed, estimates of the total quantity of oil contained in the pool, when made shortly after discovery of the pool, are hazardous and subject to considerable error.

Judge New Pools Carefully

"For this reason a relatively small area is assigned to such a pool but not without full realization that subsequent drilling may extend the area and therefore the quantity of oil proved to be in the pool. The total of new oil estimated in this way in any given year will always be comparatively small and the total of new oil through extensions comparatively large. Again, as knowledge of the factors affecting production and well performance become available and are studied, reserves in older fields can be estimated with greater precision and revised accordingly."

Thus, report explained, "we are dealing with essentially known data in making these estimates of reserves; therefore, new discoveries plus extensions, with whatever revisions are needed are an inventory of the new proved reserves."

Estimated Proved Petroleum Reserves in the United States

(Barrels of 42 U. S. Gallons)

	Proved Reserves as of January 1, 1942 (December 31, 1941)	Proved New Reserves (Discoveries, Extensions and Revisions) in 1942*	Production During 1942 (Bureau of Mines Preliminary)	Proved Reserves as of December 31, 1942 (Cols. 1 & 2 less 3)
	(1)	(2)	(3)	(4)
Arkansas	295,017,000	31,637,000	26,628,000	300,026,000
California	3,323,147,000	121,025,000	248 326 000	3,195,846,000
Colorado	23,443,000	18,220,000	2,220,000	39,443,000
Illinois	333 714,000	79 520,000	106,456,000	306,778,000
Indiana	22,873,000	15,643,000	6,743 000	31,773,000
Kansas	689,795,000	94,816,000	97,636,000	686,975,000
Kentucky	36,450,000	2,675,000	4 472,000	34,653,000
Louisiana	1,330,134,000	227 718,000	115,726,000	1,442,126,000
Michigan	55 620,000	29 977,000	21,754,000	63 843,000
Mississippi	80,207,000	—10 477,000†	28,833 000	40,897,000
Montana	86,124,000	7,508,000	8,074,000	85,558,000
Nebraska	4,014,000	—600,000†	1,237,000	2 177,000
New Mexico	674,817,000	34,224,000	31 544,000	677,497,000
New York	59,816,000	none	5,421,000	54,395,000
Ohio	37,404,000	1,160,000	3 543 000	35,021,000
Oklahoma	1,035,820,000	73,797,000	140,690,000	968,927,000
Pennsylvania	170,897,000	none	17 779 000	153,118 000
Texas	10,975,641,000	1,053,457,000	483 371,000	11,545,727,000
West Virginia	50,011,000	750,000	3,574,000	47,187,000
Wyoming	304,053,000	97,911,000	31,392 000	370,572,000
Miscellaneous‡	299,000	15,000	60,000	254,000
Total United States	19,589,296,000	1,878,976,000	1,385,479,000	20,082,793,000

*This column includes proved reserves discovered in new fields plus proved reserves added by extensions of pools only partly developed a year ago, plus or minus any revisions in former estimates. Only a limited area is assigned to each new discovery even though the Committee may believe that eventually a much larger area will produce, for in this report we are concerned only with actually proved reserves.

†No discoveries; previous estimates revised downward.

‡Includes Tennessee, Missouri, Utah and Virginia.

Petroleum for War

U. S. Faces Serious Shortage and May Not Meet War Needs if War Department Requirements Continue for 2-3 Years, 3 PAW Deputies Tell House

NPN News Bureau

WASHINGTON—Threat of a domestic crude oil shortage is so real in the face of enormous military demand that it may be necessary for the U. S. to plan on using petroleum producing areas of the entire world to feed its mechanized war machine.

So said PAW officials in testifying before a House appropriations subcommittee on Feb. 15. Their testimony has just been released by the committee.

Military operations in Europe and Asia forecast by President Roosevelt would create additional consumption "that to call it worse in this country would just be putting it mildly" if those operations use oil the way American troops did in North Africa, Assistant Deputy Petroleum Administrator Allen said.

"We have the War Department's estimate of its requirements which is naturally somewhat vague as to sufficiency," he said. "But I can say that if those requirements as presented to us are correct as they stand for the next 2 or 3 years, very grave doubts will arise as to whether this country, from its domestic sources of petroleum production, will be able to meet them.

Must Seek Other Sources

"We, therefore, must, as part of our operations, study and survey the alternative of using the petroleum resources of the entire world, wherever they may be, and plan and arrange for those sources to be available in advance to our military forces."

E. L. DeGolyer, assistant deputy administrator, said Germany's principal source of petroleum is Rumania where it gets maybe 100,000 b/d plus from 15,000 to 25,000 b/d from Austria, Hungary, Poland and Germany. He said U. S. does not know how much motor fuel Germany extracts from coal by hydrogenation.

Bruce Brown, assistant deputy administrator, said Germany should have run out of reserve supplies of oil a year or two ago, and remarked this may be the reason for the Russian set-back.

Mr. Allen said American and other Allied crude production would be 5,500,000 b/d, but if foreign reserves have to be tapped, the money and material expenditure would be "very heavy".

Our margin between present and potential production is so low it is "uncomfortable", he added.

Mr. DeGolyer said: "The bulk of our excess capacity lies in the state of Texas, chiefly

in West Texas. Some of it is on the Gulf Coast, and the greatest amount in west Texas. We have no excess capacity in the state of California. I think we are going right along against our ceiling there, and I suspect the demands for California oil will be in excess of our ability to produce during the second or third quarter of the present year. Kansas is producing all it can. Oklahoma is producing all it can, and has been for a number of years. Illinois is producing wide open. Pennsylvania is producing all it can. Michigan is producing all it can."

California Legislative Group Asks Crude Price Increase

Special to NPN

LOS ANGELES—To avoid serious and critical shortage of crude oil and its by-products, a "reasonable, substantial increase in prices for all oil produced in California" was asked of the OPA by the interim oil committee of the California State Assembly.

The request was contained in a resolution authorized by the committee and it was immediately transmitted to OPA, PAW, and California members of Congress.

Cosden Hot Oil Indictment To Be Argued March 10

Special to NPN

AUSTIN—March 10 has been set as the date Federal Judge Charles A. Boynton will hear oral arguments in the Connally Hot Oil act and conspiracy indictment against the Cosden Petroleum Corp. and its officers.

In the first hearing at Waco, R. L. Tollett of Big Spring, Tex., president of Cosden, pleaded nolo contendere for the corporation and innocent for himself.

Two other company officials, R. W. Thompson, superintendent of production and pipeline, and H. L. Weeks, Big Spring district production superintendent, pleaded nolo contendere to the hot oil act violation charges and innocent on the conspiracy part of the indictment.

The company and the 3 officers were indicted by a federal grand jury in El Paso June 22. The indictment charged that gasoline had been shipped in interstate commerce that had been produced in violation of Texas Railroad Commission allowables.

Use of Material for New Gas Wells Banned in Texas Panhandle

NPN News Bureau

WASHINGTON—PAW Feb. 24 banned use of material for drilling new natural gas wells in Texas Panhandle field with issuance of PAO No. 9, effective immediately.

Order prohibits use of any materials to drill, complete, or provide additions to any well in any discovered or undiscovered natural gas field in Carson, Collingsworth, Gray, Hansfield, Hartley, Hutchinson, Moore, Potter, Sherman or Wheeler Counties, Tex., PAW said.

Exceptions to ban, PAW said, may be issued. Applications must be made by filing a letter in quadruplicate or by sending telegram to Director, Natural Gas and Natural Gasoline Division, PAW, Interior Bldg., Washington, D. C., Ref. PAO No. 9.

OPA Hikes Ceilings 20c On Black Crude In 20 Wyoming Fields

NPN News Bureau

WASHINGTON—Maximum prices for Wyoming black crude oils were raised 15c per bbl. in 20 fields on Feb. 27 by OPA with issuance of Amendment 71 to RPS 88, effective Feb. 26.

The new maximum prices at the receiving tank for black oils produced in the fields designated are as follows:

Field	Price per bbl.
Black Mountain	$0.55
Byron	0.70
Circle Ridge	0.65
Dallas and Derby	0.55
Frannie, Light	0.85
Frannie, heavy	0.62
Garland	0.60
Grass Creek, heavy	0.65
Hamilton Dome	0.60
Hudson (Lander)	0.725
Maverick Springs	0.6625
Notches	0.75
Oregon Basin	0.65
Pilot Butte	0.80
Poison Spider	0.65
South Casper Creek	0.65
Spindletop	0.65
Shoshone	0.65
Salt Creek, Tensleep	0.8285
Sheep Creek	0.65

"The action was taken," OPA said, "in order to maintain supply and provide a fair and equitable return of those producers who develop new production in accordance with the recommendations of the Petroleum Administration for War."

To Give 'Fair Return'

The new maximum prices, OPA estimated, will tend to maintain production which averaged about 35,000 b/d in 1942, and provide a fair return to those who may develop new production. OPA said there were about 350 black oil wells in the 20 fields on Jan. 1, 1943.

It was recognized, OPA added, that Wyoming's black oil resources might not be developed at the former maximum prices—frozen at about 50c per bbl. on the basis of Oct. 1, 1941, prices—and that increasing demand for heavy fuel oil has made development of these crudes necessary.

Heavy industrial fuel oil, asphalt products, and road oils are some of the products made from Wyoming black crude and its market, OPA said, extends as far East as Minneapolis, and some of it may be routed to the industrial Northwest if freight rates permit.

Asks for Cores, Brine, Crude In Study of Oil's Origin

NPN News Bureau

LOS ANGELES—Answer to the question of how oil was formed may be solved in California oil fields if oil men there will cooperate in furnishing samples of oil well corings, brines, and crude oils, Dr. Claude E. ZoBell, associate professor of microbiology and assistant to the director, Scripps Institute of Oceanography, believes. He spoke Feb. 19 before the Pacific section of the American Assn. of Petroleum Geologists on "Bacteria as Geological Agents", discussing the American Petroleum Institute's research project on the origin of oil.

Scripps Institute scientists for many years have been studying distribution and activity of micro-organisms in marine sediments, for the presence of living micro-organisms and for environmental conditions that might influence their activities, according to Clifton W. Johnson, publicity committee, A.A.P.G. Pacific Section.

Texas Follows Quota Despite Protests

Special to NPN

AUSTIN—Production for March for the Texas Gulf Coast district was raised 52,184 b/d by the Texas Railroad commission, which ordered an average production of 1,501,801 b/d for the state.

The commission, despite violent protests from west Texas and other producers at the Fort Worth statewide hearing, followed PAW's request that the March increase for Texas come from the Gulf Coast district.

"PAW requests are in effect directives," Commissioner Olin Culberson told NPN, "and there's not much we can do for the duration but follow them."

Mr. Culberson said, however, that the Gulf Coast region was the logical region to take the added oil from, since the district produces sweet crude of the type immediately needed. PAW specified that the increase was granted to fill the "big inch" pipeline, and a representative told the statewide hearing that less transportation problems would be encountered by taking it from the Gulf Coast than any other section.

Oklahoma Sets March Quota

Special to NPN

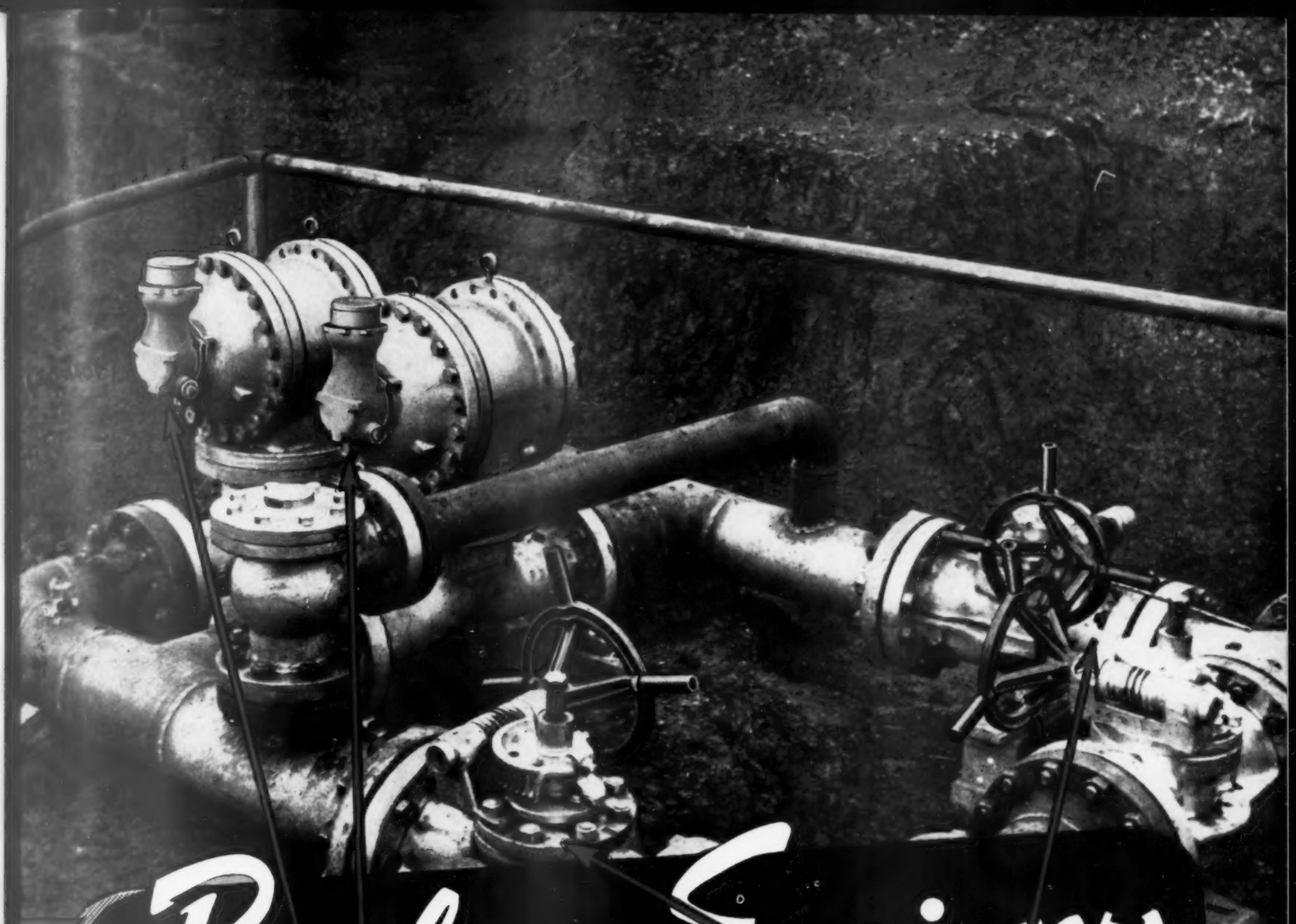
OKLAHOMA CITY—Oklahoma Corporation Commission set March allowable production of all petroleum liquids at 390,700 b/d, same as PAW recommendation and down 4,600 b/d from February figure. Crude oil production was set at 360,700 b/d, and 30,000 bbls. were allotted to other petroleum liquids.

Crude Stocks Increase

NPN News Bureau

WASHINGTON—Stocks of U. S. and foreign crude totaled 234,562,000 bbls. on Feb. 20 compared with 234,239,000 bbls. the previous week, Bureau of Mines reported Feb. 27.

Largest increases were reported for Illinois-Indiana, up 366,000 bbls.; Texas, up 211,000; New Mexico, up 209,000; and California, up 189,000. Only large drop was in Oklahoma, down 631,000 bbls.—all other areas showed little change.



Petroleum Engineers Rely on

Pittsburgh ROTOCYCLE Meters

Nordstrom Lubricated Valves

FOR ACCURATE PIPE LINE *Measurement and Control*

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Oil TRANSPORTATION

Truck Maintenance

ODT Organizes Program To Keep Trucks Rolling Despite Mechanic, Parts and Driver Shortages. Committees Named To Work with ODT Offices

NPN News Bureau

WASHINGTON—ODT is developing a definite program for preventive maintenance to keep trucks and buses in operation despite shortages of parts, drivers and mechanics.

Keystone of the program is the appointment of Maintenance Advisory Committees—men taken from automotive industry—to work with ODT's 140 district offices.

Working with each committee will be a man from the ODT district office, especially assigned to maintenance work.

What Committees are to Do

Some of the things these committees are scheduled to do include establishment of used parts yards, location of garages and shops with the equipment and men to carry on maintenance work, and development for future use—if necessary—of plans for pooling maintenance equipment and manpower.

The permanent committees will be drawn from private and for-hire carriers, truck factory branches, truck and automobile dealers, garages and parts jobbers.

Six-Point Program Listed

Six specific jobs have been cut out for the committees.

First, they will help compile information on local problems of maintenanace facilities, replacement parts, available maintenance materials, manpower, and effect of government regulations on maintenance.

Second, they will distribute information on all government orders affecting tire and vehicle maintenance.

Third, they will "assist automotive, tire, parts and oil companies cooperating in the U. S. Truck Conservation Corps in promoting greater interest in preventive maintenance among vehicle owners, drivers and mechanics."

Fourth, they will help distribute information, to maintenance men and establishments, compiled by SAE-ODT Maintenanace Methods Coordinating Committee and its various subcommittees working with the Vehicle Maintenance Section.

Fifth, they will advise dealers, garage owners, jobbers and other maintenance organizations, schools and other interested groups in developing training programs for mechanics and drivers.

Sixth, they will gather information on the possibilities of and the procedures to be followed in pooling maintenance facilities, tools and manpower, if and when such action may become necessary or desirable.

ODT to Submit Legislation On State Trade Barriers

NPN News Bureau

WASHINGTON—Uniform legislation is to be introduced in state legislatures this year to give governors extraordinary powers on trade barriers, ODT announced officially on Feb. 26.

ODT cited the adverse effect of some state laws on interstate operation of tank trucks, telling of one operator who needed tandem tanks to move asphalt to a Navy airport site. His state—in the East—refused to comply with the federal government's request because local laws forbade use of more than two vehicles.

35-Mile Limit Requires 12% More Trucks, A.T.A. Survey Shows

NPN News Bureau

WASHINGTON—The 35 m.p.h. speed limit places such an extra burden on motor carriers that they will need 12% more trucks and 18% more men than required to move the same tonnage at normal speeds, a survey of 525 trucking companies by American Trucking Assns. indicates.

Tire manufacturers agree, A.T.A. said, that the 35 m.p.h. limit will mean a saving of 12% in rubber for 400,000 over-the-road trucks, but this, it was asserted, means a saving of only 2000 tons annually.

The A.T.A. survey covered trucking companies employing 39,713 drivers to operate 32,448 vehicles. It revealed, according to A.T.A., that if these companies are limited to 35 m.p.h. they will need 7379 more men and 3951 additional trucks.

Typical Tests Cited

Typical results of 2 test runs made for the survey were cited by A.T.A. as follows:

Garrett Freight Lines, Pocatello, Idaho, using identical equipment at 35 and 45 m.p.h., lost 26% in running time with the slower speed, increased gear changes 47% and brake applications 177%.

M. D. Savage Transportation Co., on Los Angeles-San Francisco runs, lost 22% in running time at 35 m.p.h. and increased gear changes 184% and brake applications 160%.

Would Cancel Short-Haul Rates

NPN News Bureau

CHICAGO — Illinois Freight Assn. has docketed proposal to cancel short haul, truck-compelled rail rates from pipeline, refinery and water terminals in Illinois to Illinois destinations. No date for hearing was set.

Inasmuch as short tank car hauls are now eliminated, the rates are no longer in use, R. G. Raasch, association chairman, said.

Expect ODT to Specify Minimum Dumps, Prohibit 'Call-Backs'

NPN News Bureau

WASHINGTON—ODT is preparing to shelve plans for voluntary pooling of local tank wagon deliveries and issue instead a nationwide order which probably will specify minimum dumps, call for 48-hour advance notice on deliveries and eliminate special deliveries and call backs.

ODT officials are not in a position yet to outline their plan exactly since it is still in the formative stage.

They gave assurance, however, that no order would be issued until the industry was satisfied. In that connection, the petroleum carriers section of ODT's motor transport division is meeting with representatives of both majors and independents to discuss the program.

May Use PAW Ideas

Recently, PAW developed a plan for minimum tank truck deliveries but informed sources understand the oil agency has cast aside the plan. Some consider it likely that major features—or something similar—of the PAW plan may be embodied in ODT's order.

PAW plan called for minimum dumps at service station of 60% of a station's capacity for a particular grade of gasoline or a full tank truck. For bulk consumers, minimum would be the same as for service stations or 200 gal.

Minimum dump for farm deliveries of gasoline would be 35 gal. For kerosine, a floor of 25 gal. would be provided, except that this would not apply on East Coast.

OPA and ODT 'Simplify' Rules For Transport Rations

NPN News Bureau

WASHINGTON—ODT and OPA Feb. 24 arranged for mailing of 3rd and 4th quarter transport rations to all commercial motor vehicle operators holding single-unit certificates of war necessity, to "simplify rationing procedure further," it was announced.

This means, they said, that after July 1, "only 243,000" of U. S. trucks, busses and taxicab operators need to appear personally before war price and rationing boards for the quarterly renewal of gasoline rations.

Fleet rations cannot be mailed, the agencies said, because they are usually issued in such large quantities as to make mailing hazardous and difficult, but fleet operators will be notified by their rationing boards when their gasoline coupons are ready, and they may then pick them up without delay or use of further application forms.

The new procedure is contained in Amendment 25 to RO 5C, effective March 2.

BIG TANDEMS and TRAINS

War Production Board emergency plans call for the *release of a limited number of large units*—Semi-trailers of 5,000 gallons and larger, and big Trains.

We can make prompt delivery on large units of any type or size. **Please fill out and mail the attached coupon so we can give you payload figures, weights, dimensions and load distribution for *your* particular operation.**

Standard Steel Works

NORTH KANSAS CITY, MO., U.S.A.

STANDARD STEEL WORKS 16TH and Howell St. North Kansas City, Mo.

Please send without obligation information on ☐ Tandem Axle Semi-Trailers ☐ Transport Trains

States to be operated in _____

Company name _____ Tractor to be used _____

Street address _____

City _____ State _____

ODT's new Division of Petroleum and Other Liquid Transport, just organized, is already hard at work. But the officials stopped long enough to pose enmasse for NPN's camera. Seated, left to right, are: Harry R. Lewis, assistant to Division Director Dow; Robert W. Shields, associate director in charge of pipelines; Porter L. Howard, associate director; Maj. Joseph E. Keller, Army Transportation Corps and ODT consultant on trade barriers; Ayden A. Dibble, chief of the pipeline section; F. H. Tutt, in charge of permit section of Section of Tank Car Service; E. G. Waring, assistant to A. V. Bourque; G. E. Everett, chief of the petroleum unit of the Section of Tank Car Service; and A. V. Bourque, associate director of the division in charge of Section of Tank Car Service. Standing, left to right, are: John W. Painter, head of the Houston regional office of Tank Car Section; George J. Reynolds, chief of the unit of other liquids in Tank Car Section; H. P. Ross, first assistant to Mr. Everett; R. A. Greene, head of New York office of Tank Car Section; and David T. Rotroff, assistant to Mr. Everett

Oil Transport Division Expanded

ODT Consolidates Several Divisions into New Division of Petroleum And Other Liquid Transport. Fayette B. Dow Directs Enlarged Staff

Fayette B. Dow, director of the ODT Division of Petroleum and Other Liquid Transport, now heads an enlarged staff with new associate directors to help handle new duties

NPN News Bureau

WASHINGTON—A more powerful division of petroleum transportation is starting to function in ODT. Organization of the Division of Petroleum and Other Liquid Transport has been greatly expanded, and its duties enlarged to cover the supervision and coordination of petroleum transportation handled by Divisions of Railway Transport, Traffic Movement, Inland Waterways, Great Lakes Carriers, and Motor Transport.

Fayette B. Dow remains director of the expanded division but he has been given a number of associate directors to handle particular phases of the work.

Sun Traffic Chief Called

Porter L. Howard was called in from the Sun Oil Co., Philadelphia, to be an associate director. His duties will be similar to those of Mr. Dow, in supervising and coordinating the duties of the other division. Mr. Howard was general traffic manager for Sun, and has been in the oil and transportation business since 1905, with a brief turn in France during the first World War.

Robert W. Shields was another of those made an associate director. An ICC engineer for 28 years, he formerly headed the ODT pipeline section. "He will represent the ODT and the division in all activities connected with the construction, enlargement, interconnection, and operation of pipelines, handling in particular the engineering phases of these programs," ODT said.

A. V. Bourque, chief of the tank car service section was elevated to the post of associate director in charge of the same section. "He will be responsible," said ODT, "for keeping industry, as well as the Army, Navy, and other government agencies, supplied with tank cars sufficient for all essential needs."

Lewis Named Dow's Assistant

Mr. Dow's assistant is Harry R. Lewis, Warren, Pa., who will handle special assignments for the division. He is president of Harry R. Lewis Co., a petroleum specialties firm, and was president of Hyvis Oils, Inc., as well as president and general manager of Conewango Refinery Co.

ODT went to the War Department to tap E. G. Waring on the shoulder and call him over as Mr. Bourque's assistant. A former official of Missouri Pacific Railroad, he had been with the War Department for more than a year as industrial traffic specialist.

G. E. Everett, who has been assistant chief of the Section of Tank Car Service, was named chief of the Petroleum Unit of that section. "Mr. Everett," ODT said, "will supervise the ODT program to improve the utilization of tank cars in petroleum traffic." Formerly, he was with A. P. I. Western Petroleum Refiners Assn., Transcontinental and Western Air, and several railroads.

George J. Reynolds was beckoned from Procter and Gamble Co. to be chief of the Unit of Other Liquids in the Section of Tank Car Service. He hails from New York

FOR VICTORY
BUY UNITED STATES WAR BONDS AND STAMPS

Today large stocks of Champion Spark Plugs are showing up with our armed forces in some of the most out-of-the-way spots in the world.

Thus Champions are getting in their punches at the Axis, in the hard-hitting mechanized vehicles and auxiliaries of every size and type in use by our armed forces—while having to limit the supply on the home front.

Champion Spark Plugs were never more outstanding, and have never demonstrated their characteristic advantages to better advantage than now. They are found in American-built jeeps, trucks, half-tracs, tanks, tank destroyers, planes, boats, and other war vehicles and everywhere are noted for their dependability.

The day will come when the balance of distribution will swing back from wartime emergencies to peacetime needs, and then, as always, you will find Champions the better spark plugs—with better performance, greater public acceptance, and therefore logically your preferred stock investment.

194- V DAY

CHAMPION SPARK PLUGS

City. His unit covers alcohol, chemicals, fats, oils, etc.

Pipelines Under Dibble

Ayden A. Dibble was named chief of the pipeline section, of which he has been chief engineer since last June. Formerly he was an ICC engineer.

Mr. Everett was given 2 assistants. They are H. P. Ross, taken from the Army where he was in charge of tank car movements for Quartermaster Corps, and David H. Rotroff, Chicago, of Nashville, Chattanooga and St. Louis Railway.

Joseph E. Keller, Major, Transportation Corps, Highway Division, War Department, remains as an ODT consultant on state trade barriers, as does F. H. Tutt—formerly of Vickers Petroleum Co.—who has handled tank car permits since last June.

An important function of the new division is its decentralization wherein field offices will issue tank car permits, in addition to removing surplus tank cars from one service to another, studying tank car efficiency, and expediting loading, movement and unloading of the cars.

Regional managers are:

R. A. Green, with offices in New York. He formerly was with Standard Oil Co. of New Jersey.

Eugene Jackson, offices in San Francisco. He was with Wine Institute of America.

John W. Painter, offices in Houston, Tex., formerly with Texaco, Sims Oil Co., and Deep Water Refining Co.

ODT To Control Transfers Of Commercial Vehicles

NPN News Bureau

WASHINGTON—Control by ODT over commercial motor vehicles transferred from one carrier to another, regardless of types of carriers involved, was effected Feb. 25 in Amendment to General Order ODT No. 21.

Original order, ODT said, did not empower ODT to require renting or leasing of equipment by common or contract carrier to private carrier. Amendment removes this "limitation of authority."

Transfer of commercial motor vehicle from one carrier to another may be required, ODT said, when it deems it "advisable or necessary to the prosecution of the war or to the maintenance of essential civilian economy or in the public interest...."

'Showdown' Meeting Held On Products Pipeline

NPN News Bureau

WASHINGTON — The controversy over which section of the 20-in. products pipeline should be built first—the western section from Texas to Illinois or the eastern section from Illinois to the East Coast—was under discussion at a "showdown" conference behind closed doors at PAW on Feb. 26.

But when the all-day meeting broke up, the question was taken under advisement by PAW, which will apparently make the final decision. A high PAW official described the conference as a "hearing".

One of the conferees called the hearing a "snappy" one, with opposing forces clashing over merits of the two proposals.

PAW Chief Ickes opened the conference, urging a prompt decision. He had previously decided to build the southwestern leg of the line first, but withheld a final decision when Frank Phillips (Phillips Petroleum), chairman of the District 2 general committee, urged building the eastern leg first.

Mr. Ickes' remarks to the conference were few. He turned the meeting over to the Deputy PAW Davies, then left.

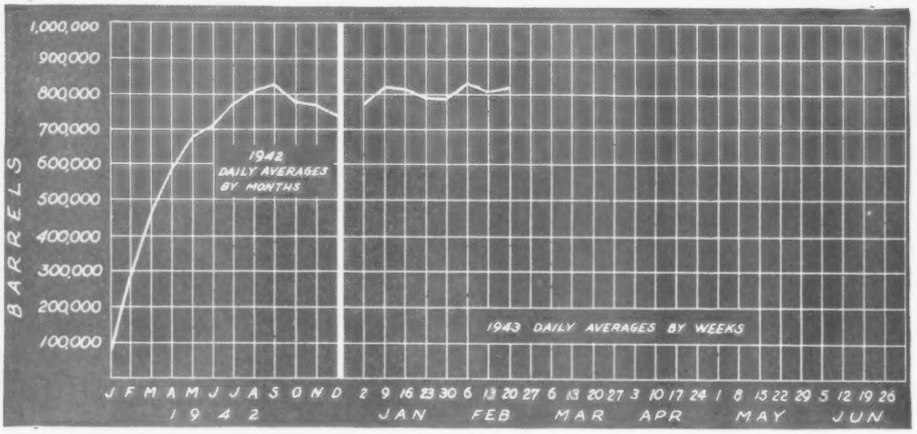
Present were representatives of the general committees of Districts 1, 2, 3 and 4, pipeline management and engineering committees, and Army and Navy.

RFC To Buy Natural Gas Line From Houston Gulf Gas

NPN News Bureau

WASHINGTON—Upon PAW's recommendation, Defense Plant Corp., RFC subsidiary, has agreed to purchase existing 14 in. and 16 in. natural gas line, owned by Houston Gulf Gas Co., extending from Refugio, Tex., to Pierce Junction, Tex., RFC Chairman Jones announced Feb. 24.

Pertinent facts: 154 miles long; acquisition cost, about $2,625,000; it will connect existing oil pipelines between Corpus Christi and Longview, Tex.; and will be operated "to supply a part of the daily requirements for oil" to be carried through the "big-inch".



820,553 b/d Hauled to East Coast by Tank Cars

NPN News Bureau

WASHINGTON—Tank car hauls of crude and products to the East totaled 820,553 b/d during week ended Feb. 20 compared with 803,976 b/d during previous week, PAW reported Feb. 25. Total of 52 participating oil companies loaded 26,592 cars as follows:

Company	Cars	Company	Cars	Company	Cars
Allied	88	Gulf	2212	Shell	842
American Bitumuls	37	Hartol	267	Sinclair	2611
Amsco	355	Hess, Inc.	12	Socony-Vacuum	3010
Arkansas Fuel	128	Home Oil	1	States Fuel	39
Ashland Refining	100	Frontier Oil	6	Southland	14
Asiatic Petroleum	211	Pan American	1418	California Standard	35
Atlantic Refining	1862	Petrol Corp.	282	Kentucky Standard	101
Bell Oil & Gas	37	Petroleum Heat & Power	133	New Jersey Standard	5847
James B. Berry Sons	4	Phillips	50	Sohio	74
Chalmette	24	Pioneer Asphalt	2	Sun	2333
Cities Service	1010	Pure	271	Talco Asphalt	18
Conoco	345	Republic	152	Texaco	1329
Crown Central	12	Roosevelt	4	Tide Water	1232
Daugherty Refinery	24	Royal Petroleum	14	White Fuel	46

Drummed Kerosine Hauls Up

NPN News Bureau

WASHINGTON—Kerosine-in-drums to New England continued to rise during the week ended Feb. 20. The "make-shift" idea accounted for 168,272 bbls. of kerosine which moved through New England gateways, according to PAW, or 24,039 b/d. Total of 131,350 drums were used, carried by 683 box cars.

Mansfield Expects Action Soon On Trans-Florida Waterway

NPN News Bureau

WASHINGTON—Commenting on a full-page advertisement in the *Washington Post* Feb. 26, accusing "selfish opposition" of blocking construction of the Florida barge canal, Rep. Mansfield, Tex., sponsor of the project, told NPN he hoped to get a committee report on the necessary appropriation "very soon".

Construction of the canal has been authorized by Congress, but funds await approval of the War Department civil functions bill by a

New Sinclair Line Operates

Special to NPN

HOUSTON—Sinclair Refining Co.'s new 149-mile, 8-in. pipeline from Corpus Christi to Houston is now in full operation at its capacity of 22,000 b/d, according to company officials.

DIAMOND D-X DISTRIBUTORS

Have the Answer to Present-Day Problems

Typical Letters Prove Wartime Value of Diamond Dealer Cooperation Plan.

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Products of Mid-Continent Petroleum Corporation

D-X SUNOCO AND DX ETHYL

DIAMOND 760 MOTOR OIL — DIAMOND GREASES

THE KUNZ OIL CO.
Minneapolis, Minn.

Mr. W. J. Herr
Mid-Continent Petroleum Corporation
Chicago, Illinois

Dear Mr. Herr:

After six years as distributor of Diamond Products in Minneapolis and central Minnesota, our sales have now reached over 7,000,000 gallons annually, distributed through 12 bulk plants and 87 service stations.

We are now in our 55th year as a distributor of petroleum products, and we are glad to say that our increase in sales since becoming a Diamond Distributor has been more than satisfactory. Our progress has been steady and the new accounts and dealers obtained have remained satisfied customers. We believe that the uniform high quality of all Diamond Products supported by proved merchandising plans has contributed largely to our increases in gallonage.

Yours truly,
THE KUNZ OIL COMPANY
William J. Kunz, Manager

Products of Mid-Continent Petroleum Corporation

D-X SUNOCO AND DX ETHYL

DIAMOND 760 MOTOR OIL — DIAMOND GREASES

TANK CAR SERVICE CO.
Eau Claire, Wis.

Mr. W. J. Herr, District Manager
Mid-Continent Petroleum Corporation
Chicago, Illinois

Dear Mr. Herr:

In 1933 we were handling a private brand gasoline and serving eight retail outlets. A representative of your company convinced us that a Diamond D-X Distributor franchise would be of great benefit...and it has been, as proved by the fact that we now supply 25 retail outlets and our annual gallonage has reached a figure well over 1,400,000 gallons.

Your company's merchandise, D-X Lubricating Motor Fuel and Diamond 760 Motor Oil, has made us many new customers. I can give credit to your advertising and merchandising for bringing these consumers in for trial purchases, and the quality made them steady customers.

Very truly yours,
TANK CAR SERVICE COMPANY
By A. H. Talbert

Products of Mid-Continent Petroleum Corporation

D-X SUNOCO AND DX ETHYL

DIAMOND 760 MOTOR OIL — DIAMOND GREASES

NEW ERA OIL CO.
Belleville, Illinois

Mr. Fred Smith, Tulsa Div. Mgr.,
Mid-Continent Petroleum Corporation,
Tulsa, Oklahoma.

Dear Mr. Smith:

As we approach the end of our 14th year as distributors of the fine line of Diamond Products we take this opportunity to express our sincere appreciation for the close cooperation always received from the Mid-Continent Corporation and its representatives.

We commend your company most highly for the excellent continuity of advertising programs and the many helpful merchandising meetings in which the Sales Promotion Department outlined tried and proved merchandising methods, all of which assisted us in doing a better job. As a result of the quality of Diamond Products and the sales assistance extended distributors, companies like ours will be greatly benefited in the struggle to survive the trying times.

Yours very truly,
NEW ERA OIL COMPANY
By Theo. W. Beuchel

Wisconsin D-X Distributor Gives Credit to Advertising and Merchandising Ideas

★

Old Minnesota Company says Proved Merchandising Plans Have Contributed Largely to Increases

★

D-X Cooperation Helps Illinois Distributor Do a Better Job In Trying Times

★

Throughout the Mid-Continent area distributors and dealers are staying in business with the help of Diamond D-X wartime sales aids. In spite of the necessary restrictions of gasoline rationing, a profitable volume of business can be secured—and Diamond D-X dealers are proving it every day. With timely merchandising plans and promotions developed by Mid-Continent, they have been able to adjust their businesses to the wartime picture—they have found the way to meet existing conditions. The descriptive booklets, manuals and educational films have proved invaluable aids to many. The answer to *your* wartime sales difficulties and business problems may be found in Diamond Cooperation. A Diamond D-X representative will call on you at your request with full details, without obligation. Write your nearest Mid-Continent office.

MID-CONTINENT PETROLEUM CORPORATION

CHICAGO OMAHA TULSA WATERLOO TERRE HAUTE

Petroleum Marketing . . .

Standard of New Jersey Performs Service for Entire Industry In Opening Own Books to Prove Oil Marketing's Efficiency

HEREWITH is the first of several articles, specially written for NPN, wherein the top director in charge of all the Standard of New Jersey's marketing, and two of his cost and marketing experts, present facts and figures from the company's own books as to the reasonableness and economy of pre-war and today's oil marketing costs.

This is the first time, at least in years in our recollection, that a high official of a major company has opened up his own books in defense against the commonly made charges both within and without the oil industry of the alleged "waste" and "duplication" and "high cost" of marketing petroleum products.

The keen competitive urge, necessitated by the high degree of competition itself, has tended to make marketing men think and talk in terms of their own hopes and competitive aspirations. That is, most marketing men and high officials as well can always figure out a lot of reasons why competitors should not exist; how they do not, allegedly, serve any useful purpose, etc., etc. This generally can be said to be the result of a picture of a non-competitive paradise painted in their own minds—a picture wherein each marketing man would have no troubles, much gallonage, low cost and, of course, no competition.

Oil men have poisoned their own minds and the minds of their employes with their constant criticism of the "other man's" competition, criticism based for the most part on distorted interpretation of but few facts and not of *all* the facts and sometimes on no facts at all. No wonder, then, that critics of the industry use these same arguments to further their own ends of either seeking more control over the oil industry or just garnering a few more votes of the "common people" who are always assumed to hate "big business" and especially the oil business.

Whenever criticism and attack from outside the industry gets too bad, there is generally discussion within the industry of a public relations educational campaign to educate the consumer. Almost without exception discussion of these proposed campaigns, which have never materialized, overlook entirely the origin and cause of the criticism; to wit, that the origin is right within the oil industry itself among the type of competitors who at the moment are having hard sledding, and the causes, generally two, are (a) competitive methods that may be fair or unfair, but that are (b) getting the gallonage for one set of oil companies in greater proportion than the losing oil companies can afford to give up.

If this battle gets severe enough, if enough oil men lose enough gallonage and money, then the critics, particularly the Independent oil men whether producers, refiners or marketers, invariably hurry to state or federal legislative bodies and demand and generally get investigations, or they may go on to the Federal Trade Commission and the Department of Justice.

All of these government agencies act on behalf of the ultimate consumer which causes many people in the oil industry to say that if the public only understood the besieged oil companies' situation, the attacks would cease. Hence, many oil men talk about educating the general public even though an analysis clearly shows that the trouble originates within the industry and is the outgrowth of the keenest kind of competition. And our commentators within the industry generally overlook the fact that even though they may be the sufferers from this competition, the laws of this country were originally drawn and designed to create and preserve just the thing they are at the moment protesting—active, vigorous and if possible intelligent competition, and, whatever the degree of its fairness, at all events free competition.

The entire oil industry could well go to school and learn more about the operation of the laws of economics and learn more about these factors as they affect price within the oil industry. If the entire oil industry clearly understood its own economics in relation to its own practices there should be no need for any "public relations" educational campaign since no irate competitors within the industry would then be giving legislators and public law enforcement officials and the consumer, when he will listen, a distorted view of oil industry competition and oil industry operation.

Oil men are beginning to get some heretofore little regarded facts about their own operations in present surveys to try to discover plans for "joint use of marketing facilities". Those surveys, if continued as they now seem to be conducted, should result in the greatest self-educational campaign on its own economics in the country's industrial history. Such self-education is the only way for a greater measure of industrial peace within the oil industry. Once we have more understanding within the industry we will find ourselves less bothered by seemingly "outside" attacks for, as a matter of fact, the public has a high regard for us and for our products and for our low prices. We are the ones who have muddied our own waters.

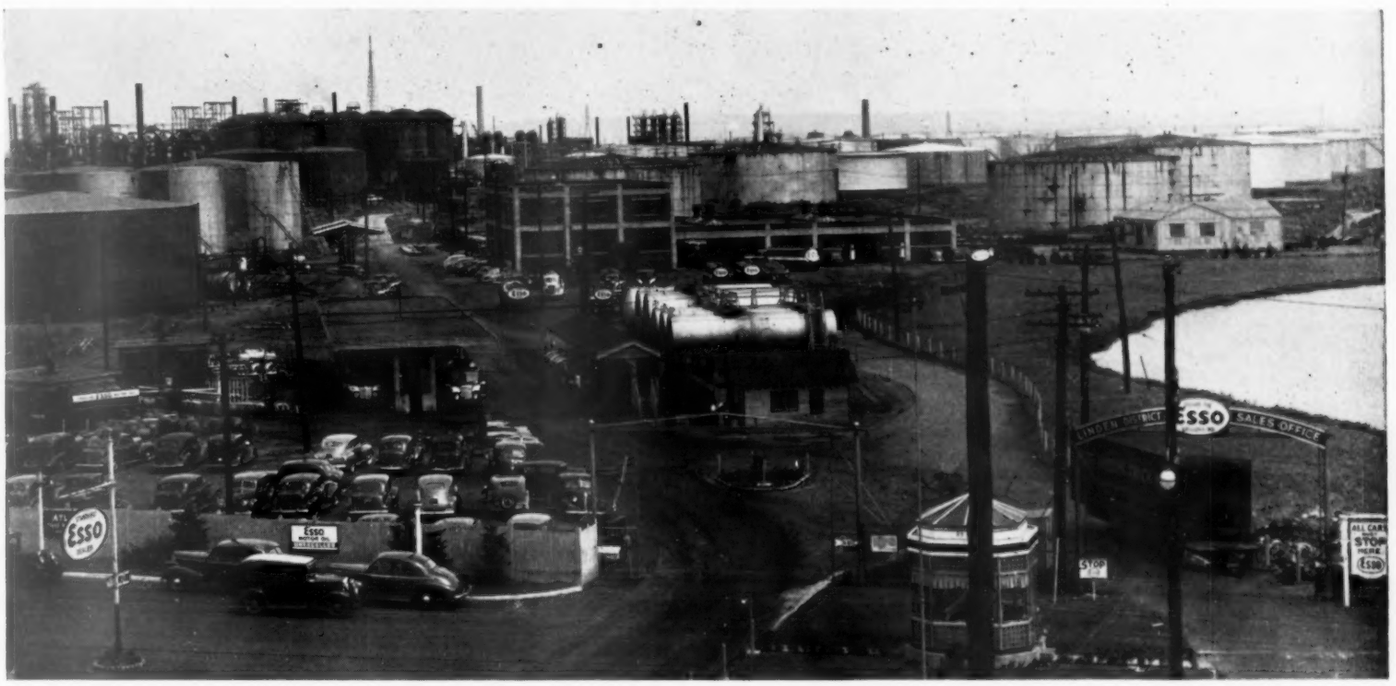
Major oil companies who have the economic and statistical experts and cost engineers should long ago have been educating all in the oil industry as to their own great efficiency. But fear of revealing a competitive advantage prevented. The present contribution to such an economic study herewith presented by the Standard of New Jersey from its own books can most properly be described as a great gift to the industry. When this series is finished we hope other companies with facts and figures from their own books will join the discussion on behalf of the whole oil industry.

This economic study and discussion is most timely today because it will help make the industry more efficient in its war effort and it will tend to preserve the greatest amount of competition for the period of further development after the war.

We shall be glad to help get answers to any questions that may occur to our readers as they study this series.

WCP, Editor.

. . . Cost and Cost Reduction



Bulk plant of Standard Oil Co. of New Jersey located adjacent to the company's Bayway refinery (in background) at Linden, N. J. Average monthly throughput is approximately 17,000,000 gal. with controllable plant costs of less than one-tenth of a cent per gallon. This bulk plant serves probably the most highly congested passenger car, truck and commercial oil consuming district in the country. Its extremely low operating cost is no standard by which to measure other bulk plants which decrease in size and gallonage as their marketing territories thin out to the sparsely settled plains of the West. Many an oil man overlooks this population factor in judging costs and hence most public officials likewise overlook the same factor—as OPA often has in trying to set an average of cost margins for oil and other products nationwide

By R. T. Haslam, F. M. Surface**, and J. R. Riddell****

PART 1

PETROLEUM Marketing is one of the 4 major departments into which the industry is usually divided. Marketing is the final step in the movement of products to the consumer and without it production, transportation and refining would go for naught, yet it is the least understood either by the public or by the average oil executive.

Petroleum marketing is often thought of as inefficient by legislators, economists and even by oil men who should be better informed. For example, one prominent oil executive recently made the following statement in a published article.

> "The oil industry may point with pride to its unequaled efficiency in production, transportation and refining. When it comes to marketing it is in the dark ages."

This statement, if true, is a severe indictment of the petroleum industry including the company whose official made this statement. If it is not true then some facts ought to be produced to offset the harm that may arise from an ill considered statement.

In a series of articles, of which this is the first, it is proposed to analyze marketing costs not only in comparison with costs in other departments of the industry, but with the cost of marketing other commodities; also to point out in detail some of the steps that have been taken by leading marketers to reduce costs and the results that have been obtained.

Let us analyze the petroleum marketing problem and some of the reasons that may have led to the above quoted statement. In the first place the majority of the higher officials of most oil companies have come up through production or refining fields. Because of this background such persons are prone to compare the discontinuous operations of marketing with the continuous flow of petroleum from wells, through pipelines or through a refinery. Marketing operations must be geared to consumer demand. Today a truck moves product in one direction but tomorrow over a totally different route. If we could arrange to have customers call at service stations at an even rate, say 20 cars per hour, instead of peaking up in the morning and evening with little in between it would be possible to have a much more efficient operation with much lower costs.

Next, it must be remembered that most petroleum products have to be marketed in bulk. If someone could devise a method of packaging gasoline or heating oil these products might be sold from grocers' shelves. But so far that it is not feasible. Besides many petroleum products are highly inflammable and must be handled with due regard to the danger involved. Hence, the marketing of petroleum products is far different from the marketing of cereals or clothing or drugs. Consequently, it is necessary to have an extensive system of bulk plants and a delivery system for bulk materials.

Furthermore, the average sale to a service station customer is only about one dollar. This sale must be made at a time and under conditions of service demanded by a discriminating public. If the average automobile had a bigger tank and if the customer were willing to fill it up in advance, or if he were willing to wait in line and to check and service his own tires and battery, much of the expense of gasoline retailing could be eliminated. But

*Director, Standard Oil Co. (N.J.).
**Manager, Sales Research Department, Standard Oil Co. of New Jersey.
***Manager, costs and operations, Sales Department, Standard Oil Co. of New Jersey.

who is going to change these demands of the motoring public, all of which cost money and for which services they are willing to pay in the price of the product?

Gasoline is usually regarded as the "money" product of the oil industry. For that reason it frequently has to carry many of the expenses of marketing other products particularly overhead and indirect expenses. If gasoline were not marketed these expenses would have to be carried by these other products.

Bearing in mind these points about the peculiarities of petroleum marketing, let us examine costs in comparison with those in other departments of the industry.

In doing this let us consider East Texas crude refined primarily for automotive products on the Atlantic Seaboard and sold to customers on the East Coast. The following figures are based on approximate pre-war costs, say in 1940-1941:

Approximate East Coast Petroleum Product Costs by Departments*

	Cost per Barrel
Producing crude	$ 0.75
Transportation	0.45
Refining	0.28
Wholesale marketing	0.30
Total	$ 1.78

*These figures are, of course, averages covering approximate major product costs. Naturally costs will vary with different types of crude, different refining procedures or different methods of transportation.

Here, curiously enough, marketing costs do not look so far out of line with the costs in other departments. True the cost of 30c per bbl. is not the cost of marketing gasoline by tank truck alone although that cost is included. It does cover the total cost of marketing all petroleum products by all methods of delivery divided by the number of barrels sold. It is a fair figure for comparison with the cost of refining, producing and transportation which also includes all products.

So, after all, perhaps petroleum marketing is not as far back in the "dark ages" as some would have us believe.

Wholesale marketing as included in the above table covers the delivery of a large portion of these products to the ultimate consumer. This is true of the tank truck delivery of gasoline to commercial and industrial consumers, the tank truck delivery of heating oils and heavy fuel oil to consumers as well as many other products.

Gasoline, on the other hand, has a further marketing cost through the retail station. On a comparable basis service station costs would add about $1.26 per bbl. to that fraction of total products sold through service stations. Since about one-third of the yield of a barrel of crude would be sold in this manner, retail operation would add another 42c to the $1.78 shown above. Even including this retail cost, much of which goes for service quite aside from the commodity, we would have a total marketing cost to the ultimate consumer of 72c per bbl. of products from crude which is less than the cost of crude at the well.

Certain phases of petroleum marketing cost considerably more than this and we propose to discuss next the wholesale costs of marketing those products which are handled through bulk plants and delivered by tank truck. Let us consider first the cost of marketing gasoline from a bulk plant and delivered by tank truck to a service station or to commercial consumers.

A typical 6000-gal. tractor semi-trailer tank truck operating out of the Linden, N. J., plant of the Standard Oil Co. of New Jersey. This outfit, operating a double shift within a radius of 40 miles, averages 160 loads per month, totaling 1,000,000 gal. Average of 23 miles is traveled per load, delivering over 2000 gal. per hour operated with an average delivery per stop of 3600 gal. This unusually large truck is the product of a highly congested oil consuming area as is the 17,000,000-gal.-per-month bulk plant

Unfortunately there are no available figures giving an average marketing cost for such products for the industry as a whole. Below we are giving what, in our opinion, represents about the average cost of marketing gasoline by the industry in the area along the Eastern Seaboard. Naturally some companies, particularly in highly concentrated consuming areas, market for very much less than the figure indicated. Also some less efficient companies and particularly those operating in more sparsely populated areas or serving the farm trade have costs well above the figures given.

Approximate average costs of marketing gasoline by tank truck from bulk plants on the Eastern Seaboard are as follows:

	Cents per Gallon
Tank Truck delivery	0.50c
Plant	0.25
Salesmen	0.15
Office (sales office and accounting)	0.30
Loan Equipment	0.25
Miscellaneous items	0.10
Advertising and signs	0.25
Overhead (corporate and sales dept.)	0.20
Total	2.00c

These figures include all controllable and non-controllable items properly chargeable to marketing operations. They include depreciation on plant and equipment, taxes, licenses, advertising of all kinds, and an allowance for corporate overhead from an integrated company.

While we believe that this figure of 2c per gal. represents about the average marketing cost for the industry, costs for individual companies, or for individual operations, may vary from this by as much as plus or minus 1c.

It is relatively easy to reduce this average cost by as much as 0.5c and, under favorable conditions, we know of large operations where these costs do not exceed 1c per gal. We also know that in many parts of the South, the Mid-West and the far West where marketing conditions are not so favorable, the expense of marketing gasoline and related products is considerably in excess of the figure given above.

The marketing of petroleum products is a highly competitive business. In most areas there are more than 20 so-called major oil companies together with dozens of independent distributors and marketing companies competing for the motorists' business. Each one of these companies is striving to get all the business that he can. It is well known that one method of increasing volume is to cut the price. That this pearl of economic wisdom has not been neglected by the oil industry is abundantly evidenced by the numerous and frequent price wars that break out either locally or over wide areas.

Under such conditions it is pretty certain that the price to the consumer is brought down to about a break-even point for the average of the industry. For the marketer who wants to keep black figures on his balance sheet it is necessary to make every effort to lower his costs and thus to gain for himself an advantage over his competitors.

In normal peacetime it is thus to the personal advantage of every marketer to keep his cost as low as possible consistent with maintaining necessary service to his customers. *In wartime it is even more important to maintain low costs. The large elements in marketing costs are labor, rubber, fuel, steel, and other construction and maintenance materials. All of these items are now critical for the war effort.* Hence, it is not only to the selfish advantage of a company but also our patriotic duty as an industry to see that marketing costs are reduced and maintained at the lowest level possible.

For the past 10 years the Esso Marketers have been engaged in an intensive study of methods to reduce marketing costs. In a succeeding article we propose to outline in considerable detail the methods we have used, the results obtained, and the type of organization we have found most helpful in obtaining these results. We know that other companies have attained similar results, sometimes no doubt by different methods. We are hopeful that our experience may be helpful to others and that it may do something to offset the "dark ages" theory now held by some members of the industry.

Beneath "Old Glory" a New Banner Flies at

COLUMBIAN

SURE we feel honored. We workers here at Columbian are mighty pleased that our war production work has won the Army-Navy "E" award.

We like to think of this "E" award as a sort of "Distinguished Service Cross". Not a medal given for bravery or courage, but for doing *our* job exceptionally well.

It takes a lot of sticking on the job . . . a lot of sweating day and night . . . a lot of the old "know how" to get this recognition. We're proud that our skill and experience *in building tanks for the storage and transportation of vital war liquids* can be of value to the boys on the battle fronts. Because we know that planes can't fly and Jeeps can't roll without gasoline and oil—and men can't fight without precious water. So we're going to keep right on delivering this important Columbian war equipment, faster and faster!

OUR 50TH ANNIVERSARY

COLUMBIAN STEEL TANK COMPANY MANUFACTURERS TANKS FOR THE WORLD KANSAS CITY, MO. U.S.A.

Coming as it does during Columbian's 50th Anniversary, the "E" award stands as the crowning achievement in the company's half a century in business. After victory, we'll all be back on our old peace-time jobs of building "Tanks for the World."

COLUMBIAN STEEL TANK CO.

P.O. Box O-4226
Kansas City, Mo.

DISTRIBUTORS

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Kevin, Montana

THE BASIN TANK CO.
Lubbock, Texas
Spearman, Texas
Odessa, Texas

T. E. WARD
30 Church Street
New York, New York

PERDUE TANK CO.
Wichita, Kansas
McPherson, Kansas
Great Bend, Kansas

THE COLUMBIAN STEEL TANK CO.
3705 McKinney
Houston, Texas

THE B & F TANK CO.
Ardmore, Oklahoma

HAMMOND-GRAY TANK COMPANY
Longview, Texas

FEDERAL TANK CO.
Tyler, Texas

McGUFFIN TANK CO.
Shreveport, Louisiana

MARTIN TANK CO.
Corsicana, Texas

With the ASSOCIATIONS

Kentucky Marketers Meet by Mail

K.P.M.A. Holds 'By-Mail Convention' to Conserve Transportation for War Use; Booklet Carries Messages from Speakers to Members

Special to NPN

LOUISVILLE — The Kentucky Petroleum Marketers Assn.'s "Convention by Mail" has been successfully concluded, winning the praise of prominent government and industry leaders who prepared statements for the novel meeting.

The association has prepared a booklet containing the texts of the addresses and resolutions submitted by mail. Copies are being mailed in turn to K.P.M.A. members. The booklet has been made to create as nearly as possible a real convention atmosphere.

K.P.M.A. Secretary Herbert L. Clay reports that 9 resolutions submitted by mail were adopted, and Dan Raibourn, Bloomfield, was appointed acting president to succeed O. A. Bakhaus, Lexington, who is now serving as a captain in the Army. Capt. Bakhaus is to hold the position of president for the duration. Terms of all officers and directors were extended for one year.

Gov. Keen Johnson of Kentucky sent a message of greeting and applauded the willingness of Kentucky oil men to aid in the war effort. He pointed to the oil industry's speedy organization of a state rubber collection setup in 24 hours and the subsequent gathering of over 18,000,000 lbs. of rubber.

Davies Stresses Operating Economy

PAW Deputy Davies stressed the importance to war effort of delivering adequate oil to industry, agriculture and civilians. He said the oil marketers had greater opportunities than any other branch to effect economies in physical operation to conserve materials, manpower and equipment.

Mr. Davies referred to surveys now being made by industry groups on joint use of facilities and assured K.P.M.A. members that decisions would not "be lightly made nor action hastily taken". He said added strains on the industry must not—and will not—find us unprepared.

Boyd Praises PAW

William R. Boyd, Jr., A.P.I. president and P.I.W.C. chairman, told the convention that every oil man from geologist to station dealer had representation in Washington through P.I.W.C. and PAW. He expressed the conviction that the PAW and Administrator Ickes will not and cannot be used by any few at the expense of others in the industry.

Marketing, Mr. Boyd said, has been affected more than any other branch of the industry. He said the public and, in many cases, the government, failed to realize its importance in providing distribution of oil for the mobile home-based army and the functioning of the whole American economy.

Jeffers Urges Conservation

Rubber Director Jeffers told the K.P.M.A. that oil marketers have a direct responsibility in carrying out tire conservation programs. Service station operators have the most direct and frequent contact with motorists and have the best opportunity to assist in applying rubber conservation measurers.

ODT Director Eastman asked K.P.M.A. members to use parts and tires on tank trucks carefully for assured future abilitly to deliver oil to their customers.

He asked marketers to eliminate small dumps, call-backs, special deliveries, and other wasteful practices. He said no distributor could be expected to abandon any practices being carried on by a competitor, but he said he had the power to require these things to be done.

He called on marketers to use large equipment on runs which will permit release of tank cars for long-haul movement in spite of hardships it might entail. He commended Kentucky oil men for what they have already done in this matter. In September, he said, ODT issued permits for movement of 654 tank car loads 100 miles or less; in January, less than 200 permits were issued due to diversion to tank trucks.

Markham Cites Truckers in Armed Forces

Baird H. Markham, director of American Petroleum Industries Committee, pointed out that 1 out of 7 men in the armed forces has been taken from the field of highway transportation and these do not include salesmen, farmers and others who used motor vehicles in business.

He urged elimination of highway barriers; conservation of highway funds for postwar highways; and a more just system of automotive taxation.

Fayette B. Dow, director of pipeline, tank cars, tankers and tank trucks for ODT, reviewed the history of the Office of Defense Transportation and how it has operated. He lauded the cooperation between government and industry in meeting all essential domestic and military demands.

Lew Ullrich, managing director, Motor Truck Club of Kentucky, hit the attitude of local draft boards in not deferring skilled truck drivers who cannot be replaced any easier than railroad engineers—who are deferred. He points out instances of severe delay in delivering war materials due to driver scarcity.

Joel Dean, director of OPA's fuel rationing division, commended the oil industry for its cooperation in making gasoline and fuel oil rationing accomplish its purpose.

He said that fuel oil rationing will continue for the duration due to supply situation. "We in the fuel rationing division in Washington shall continually strive to eliminate inequities which exist and to make the program as simple and practical as possible," he said.

Other 'Speakers'

Others who contributed to the "By Mail Convention" are: Warren C. Platt, Cleveland, NPN editor and publisher; Ernest L. Hughes, chief PAW's District 2 fuel oil section; William H. May, Frankfort, Ky., commissioner of agriculture; Ben Kilgore, Louisville, executive secretary, Kentucky Farm Bureau Federation; George G. Hatcher, Frankfort, Kentucky's Secretary of State; Congressman Emmet O'Neal (Ky.); Mark Ethridge, publisher, Louisville Courier-Journal & Times; Sen. D. C. Jones (Ky.); Wilson W. Wyatt, mayor of Louisville; Sen. A. B. Chandler (Ky.); J. L. Donaldson, commissioner of highways for Kentucky; Congressman Noble J. Gregory (Ky.); Lt. Col. Carl W. Markham, Army Ord. Dept., commanding officer; Capt. O. A. Bakhaus, K.P.M.A. president; Rodes K. Myers, Lieutenant Governor of Kentucky; P. E. Cochran, chairman of K.P.I.C.; Paul Dexheimer, OPA's Kentucky mileage rationing representative; Eugene Stuart, secretary-manager Louisville Automobile Club; and Ward J. Oates, commissioner of revenue for Kentucky.

9 Resolutions Adopted by Mail

Special to NPN

LOUISVILLE—The following resolutions, submitted by mail to members of the Kentucky Petroleum Marketers Assn. in conjunction with its "By Mail Convention", were adopted. They ask:

1—Adjustment of price ceilings as necessary to prevent elimination and destruction of those engaged in marketing and refining of oil products, particularly small business concerns;

2—No further increase in federal tax on gasoline and lubricating oils;

3—Commendation to Rubber Director Jeffers for his efforts to expedite synthetic rubber program;

4—Non-diversion of state highway funds.

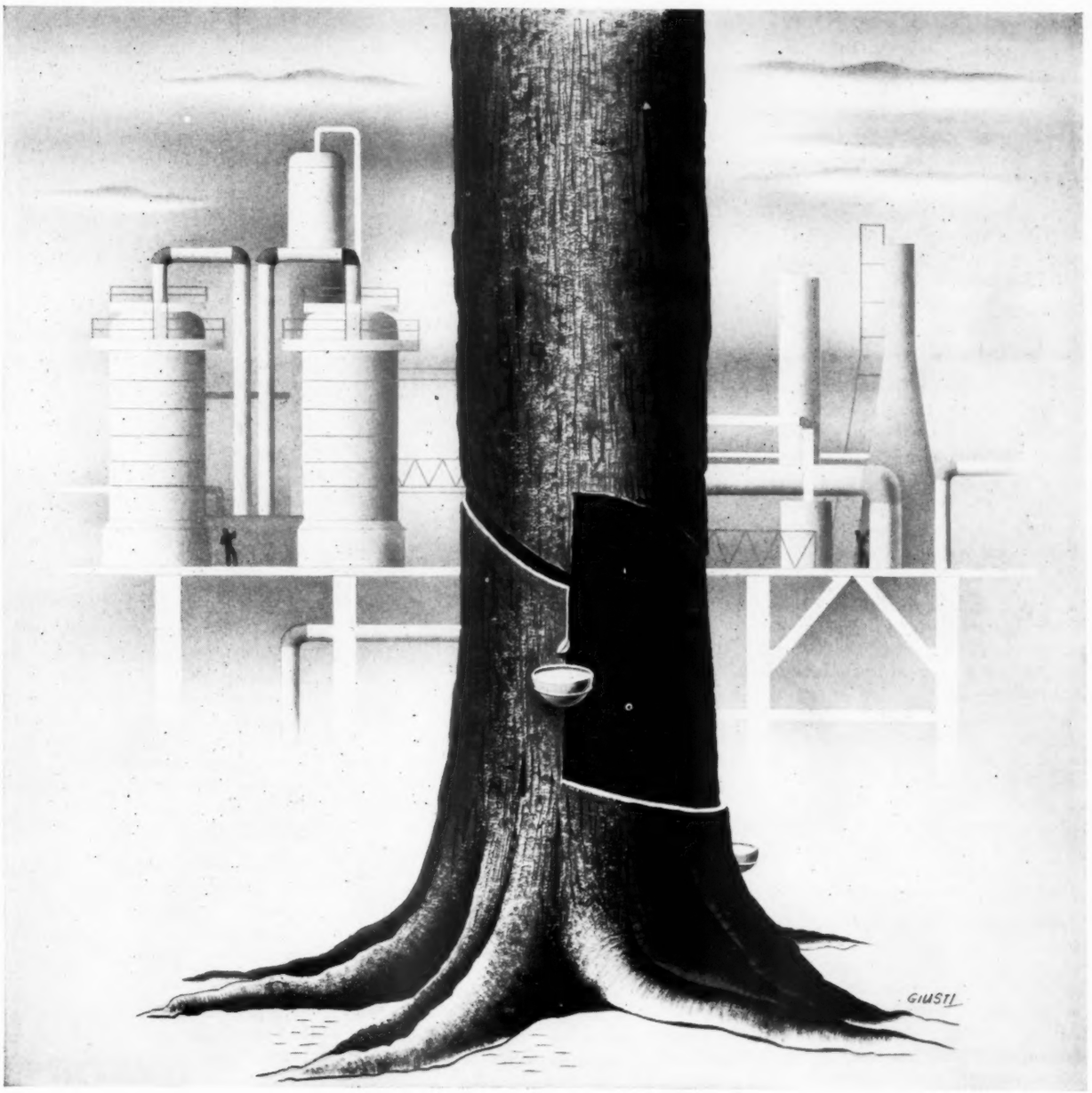
5—Uniform truck code to conform with minimum standards of American Assn. of State Highway Officials and reciprocity with other states;

6—Preservation of highway funds for postwar development of roads;

7—Retention of percentage depletion allowance on oil production;

8—Repeal of Kentucky personal and corporate income tax;

9—Representation to War Manpower Commission urging that refining and marketing be designated essential industries.



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What State Legislatures are Doing About Oil

Against a background of war that is affecting the pattern of operations in the petroleum industry, the habits of life of its motorist customers, and the finances of many states in which taxes generated by the industry are an important supporting pillar of the tax structure, the legislatures of 44 states meet in regular session in 1943.

Although many matters affecting the petroleum industry and its customers probably are still in the discussion stage, not yet having reached the legislative hoppers, the outlook on the whole is favorable.

Gasoline Taxes

Pressures for increases in gasoline tax rates have developed in several states, largely because of high fixed road charges facing reduced automotive tax revenues.

The State Highway Department of Utah has recommended a 1c increase in the motor fuel tax, but the proposal has been vigorously opposed and to date no rate increase bill has been introduced in the legislature.

In New Mexico, whose automotive tax revenue has been consumed largely by diversion, debts and "divvying" practices, gasoline tax revenue has declined to a point where most of the revenue will be absorbed by service requirements on outstanding state road debentures. The State Highway Commission has recommended an increase of the gasoline tax rate from 5c to 6c per gal., but at this writing it appears doubtful that a bill will be introduced in the legislature for such an increase. In New Mexico a measure, which was defeated in 1941, has been introduced to extend the power of gasoline taxation to the counties.

In California a measure is under consideration to increase the state gasoline tax, and in Kansas, whose exemptions permit more than one-quarter of the total gasoline consumed in the state to go tax-free, a bill to permit cities to levy a tax on motor fuel was killed. However, a companion bill to increase the state gasoline tax is pending. It is reported that a gasoline tax increase proposal may be introduced in Wyoming.

Kerosine and Liquefied Gases

In Ohio a measure is pending that would remove kerosine from the 1c liquid fuels tax. In several states bills relating to liquefied petroleum gases are under consideration.

In Massachusetts a bill was killed that would have placed the sale of such gases under the Public Utilities Commission.

In New York a measure would impose the 2% gross income tax, now collected from public utilities, on companies selling liquefied petroleum gases.

In Wisconsin a measure imposing a 7c tax per 1000 cu. ft. on natural gas was found to be broad enough to include liquefied gases. The measure, it is reported, will be amended to provide exemption for such gases.

Apparently believing in preparedness in setting its tax net, the legislature of Tennessee, a non-producing state, amended its oil severance tax law, adopted in 1941, to impose a tax of 5c per bbl. on the production of crude oil—if, as and when. To administer the severance tax, a law was enacted at this session of the legislature creating a State Oil and Gas Board.

Regulation of Vehicles of Petroleum Industry

In the two states—South Dakota and Wisconsin—where gallonage limits on tank trucks still linger in the statute books, bills were introduced for the elimination of such restrictions. The prospects for favorable action by one or both of these states are reported as excellent.

Bills affecting the marketing of petroleum products through taxation of motor vehicles carrying petroleum products have been introduced in several states.

A bill to eliminate the $10 per tank wagon tax is pending in Georgia.

In Nebraska there is a proposal to reduce a $10 tank wagon fee to $2.

A bill in Maine would relieve petroleum operators, in carrying the products of another, from liability for payment of the $15 certificate and $2 plate fees now assessed on vehicles or public utilities.

In framing legislation to "equalize" the tax burdens of motor vehicles, state officials in Maryland have sponsored a law that would subject "hawkers and peddlers of all goods, wares and merchandise" to a tax of $300 annually. Manufacturers, dairies and oil companies selling to consumers would pay a minimum fee of $50. For more than 5 trucks the fee would be increased, rising progressive ly up to $600 for more than 50 vehicles.

Business and Privilege Levies

In North Carolina a proposal to reduce service station and pump taxes 75% has been included in the revenue bill, and for that reason is expected to be accepted.

A very interesting action took place in Iowa in connection with pump taxes. A bill was introduced providing a penalty of 25% a month for delinquency in the present $3 pump tax. This was amended so as to reduce the fee to $1.50 if paid on time.

Inspection and Standards Laws

In a number of states, changes are being effected in statutory and regulatory provisions relating to standards and inspection of motor fuel. Outstanding in this trend is the progress being made in respect to the sulphur content of gasoline. In some states the allowable sulphur content was unreasonably restricted running to as low as 0.10%. Indications are that all unusually low limits on sulphur in motor fuel will be eliminated through amendment of statutes or promulgation of new regulations by administrative bodies.

In Tennessee the question of the amount of inspection fee to be paid by oil companies on kerosine and other petroleum products when exported from the state has been settled. Under a law signed by the governor the fee is fixed at 1/20 of 1c per gal., removing any doubt as to any liability of such exported products to the regular inspection fee 8/20 of 1c per gal. The clarifying measure was sponsored jointly by the administration and the Tennessee Petroleum Industries Committee.

Another measure became law in Tennessee that will be helpful to petroleum operators in that state. It permits the mixing of gasoline intended for shipment out-of-state with gasoline intended for sale within the state.

In approximately half of the 44 states convening this year proposals to strengthen, clarify and simplify administrative provisions of the gasoline tax laws have been, or will be introduced. The outlook is that in a number of states refund and exemption provisions will be tightened.

In most of the states where tax-free sales of motor fuel between licensed dealers are prohibited, efforts are being made to permit such transactions.

Diversion and Constitutional Amendments

Several governors in their messages came out against the practice of diversion of road funds, notably Governor Schricker of Indiana, who recommended that the customary annual diversion of $1.250,000 of highway revenue to the general fund be discontinued. Other governors urged that no additional roads be taken into the state system, thereby increasing the state's financial responsibility for roads of primarily local importance.

Aggressive campaigns are being carried on by highway users to bring about favorable legislative action on proposed amendments against diversion in Maine, Pennsylvania, Connecticut. New Mexico, Massachusetts, Alabama and Wisconsin.

A new development in the diversion picture has arisen in South Dakota. Apparently intent upon circumventing the provisions of the state's diversion amendment, the governor has recommended reduction, or elimination, of registration fees, and the imposition of county property levies on motor vehicles, whose revenue could be used for non-highway purposes.

Motor Vehicle Legislation

The outlook for liberalization of motor truck laws and extension of reciprocity is favorable. Higher size and weight limits have been proposed in more than a dozen states. Only one of these proposals to date has become law. The governor of Arkansas signed the measure increasing axle weight limit from 16,000 to 18,000 lbs.

A very drastic bill has been introduced in Kansas which would enable cities to prescribe weight limitations for all motor vehicles using their streets. In Tennessee a law has been enacted giving the city of Memphis the right to impose taxes on all for-hire passenger vehicles and trucks traversing its streets. A similar law giving Chattanooga such privileges was repealed.

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Courtesy Ohio Farmer

3 Million Left Farms in 2 Years

Hunger Ahead?

Survey Shows U. S. Food Output in '43 Will Be Below '42. Heavier Loads Are Being Thrown on Farm Machines and on the Oil Marketers Who Service Them

WASHINGTON — Shortage of manpower and farm equipment threatens a reduction—instead of the much-needed increase—in food production this year.

This alarming news comes from two sets of farmer-wise officials—the county agents and state commissioners of agriculture. It emphasizes the dire necessity for maximum, efficient use of machinery now on the farms. And it spotlights the program—endorsed by Deputy Petroleum Administrator Davies—for proper lubrication and care of farm trucks, tractors and other machinery.

It comes on top of Agriculture Secretary Wickard's statement: "We are shooting for a goal of about 30% above the normal production, although that will not satisfy all demands."

So, while Mr. Wickard is talking of an increase (actually it is 8% above 1942, a record-breaking crop year), other officials in closer contact with farmers are predicting that 1943 production will fall considerably short of last year. They blame it on the military and war plants grabbing off farm workers, plus failure to provide farm machinery replacements.

Congress Is Aroused

This was revealed Feb. 26 with publication of secret hearings held during February by a Senate subcommittee, headed by Senator Bankhead, Ala. Besides probing Mr. Wickard's plans and poking the Army and Navy—and Mr. McNutt—for "robbing" the farmer of his labor supply, the committee also had two grass-root surveys made. One was a questionnaire answered by 2780 county agents; the other, a batch of letters from state agriculture commissioners in 38 states. Both reports were the same: labor and machine shortage will cut farm production below 1942.

Next day, a "rump session" of about 150 members of Congress met and appointed a Committee of 48, with each state represented, to draft recommendations on farm manpower and machine requirements for presentation to President Roosevelt at the White House. There is little doubt that Congress now reflects the indignation which shows between the lines of letters received by the Bankhead committee. But is it too late?

War Production Board has allotted 50,000 tons of steel for farm machinery and equipment. That isn't enough even for normal replacements. It won't be fabricated in time for spring planting. Greater use of equipment on hand is the only immediate answer. And there the oil industry comes in.

Oil men are in frequent contact with the farm trade. They have the opportunity to impress on farmers that proper lubrication and care increases the efficiency of farm machinery, as was pointed out by Deputy PAW Davies speaking Feb. 18 at Peoria, Ill. (*see NPN, Feb. 24, p. 5*).

So, with the government saying larger crops are necessary to feed American soldiers and our allies abroad, as well as civilians at home, and with farm experts predicting crop shortages, NPN suggests that it is no exaggeration to say:

Millions of American civilians will probably go hungry. The importance of the oil man's job of "selling" the farmer on proper maintenance of food-producing machinery cannot be stressed too strongly.

Congress got a gloomy picture of farm prospects from Secretary Wickard. More than 3,000,000 workers have left the farms in past two years for military service or industrial jobs. And they were the physically strong and mechanically inclined. The government plans to replace them with more women, older men and children under 14. And they hope to transfer some 500,000 workers from marginal farms to big farms ($65,000,000 appropriation is sought for transporting and housing them). But the small farmer prefers to eke out a living on his own acres rather than work for another. And the big farmer doesn't want "imported" labor. So, it looks like a stand-off.

Employs 12,000,000 Workers

Ordinarily, agriculture has a peak employment of about 12,000,000 people around July 1. And this year Secretary Wickard says "at least 12,000,000" will be needed.

Besides these year-round farm hands needed, there still remains the problem of recruiting some 3,000,000 seasonal workers to harvest crops, etc. Government sources hope to draw these from the townspeople and from retail stores and other "less essential" jobs. The farmer doesn't think much of this idea, either.

"If you ask me," said Mr. Wickard before the Bankhead Committee, "I think the food situation is going to become very critical so far as production this year is concerned; first, because of our inability to get the labor we ought to have; and, second, inability to get the farm machinery we ought to have."

Mr. Wickard blamed the military authorities for taking too many workers from the farms. Some of these workers will have to be turned back "or we are going to run the danger of not meeting the farm production goal (30% above normal), that is, the 1935-39 average) we have set for this year."

Trying to Arouse the Public

Sen. Thomas, Okla., said his mail—like that of most other senators—was filled with letters about farmers abandoning acreage because they couldn't get help and others selling out to take industrial jobs.

"If the people can be convinced they are facing a serious food shortage," said Sen. Thomas, "I think they will gladly go along with whatever program the Administration might adopt."

What worries the members of Congress is that 1942 was a record-breaking year, with crop yields 28% above normal because of exceptional weather. Even so, there were food shortages in fall of 1942. The carry-over was so slim that food rationing was instituted before the first quarter of 1943 has elapsed. Now, with less manpower, less machinery, less acreage and less fertilizer, the Administration wants an 8% increase over 1942 output. They are not satisfied that the Administration's program for attaining this goal is well-grounded.

County Agents Report

Extent of the manpower and machinery shortage, and its effect on production, was indicated in the survey in 2780 counties throughout the U. S. by county agents of the Department of Agriculture. This survey was conducted early in February at request of the Senate appropriations subcommittee. Here are some of the highlights, taken from printed hearings released Feb. 26:

Ninety-nine per cent of the counties reported a drain on manpower due to inductions into military service or taking industrial jobs. And 73% reported no replacements whatever had been made of this farm labor. What labor there has been made available in 19% of the

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counties (less than 50% replacement) was largely "inexperienced and inefficient".

Asked if there was a shortage of farm implements in such quantity as to "materially affect production", 68% of the county agents indicated a shortage of farm machinery resulting in "significantly reduced" production. And 32% indicated no "significant" shortage.

"It is to be noted, however," the Department explained, "that many of the agents in both groups indicated lack of machinery repair parts and repair materials as well as experienced repairmen. They indicated these were factors which probably would tend to reduce production by virtue of inability to keep machines in operating condition and even though the actual number of machines available in some counties was considered adequate if they could be kept in operating condition."

Extent of Reduced Acreage Given

Nearly 2000 counties—1967, to be exact—will have less acreage planted in 1943 than last year. That is 71% of the 2780 counties reporting. And 1074 counties figure on a decrease of between 10% and 30%.

Only 2% of the county agents reporting expect that 1943 production in their counties will exceed that of 1942. Thirty-one per cent estimate a decrease of 10% or less; 30% figure on a drop of 11% to 20%; and 14% see a decline of more than 30%.

Early in February, Sen. Bankhead, Ala., chairman of the appropriations subcommittee investigating the manpower situation, wrote to all state commissioners of agriculture asking them what were crop prospects in their states, assuming normal weather conditions, as compared with last year's production. Here are some excerpts from the replies, state by state:

Arizona—Production not over 80% of last year unless we have assurances within the next 60 days of sufficient labor, materials, and supplies and repair parts for machinery and equipment. . . . Farmers reluctant to plant full acreages. . . .

Arkansas—Minimum of 20% reduction . . . due to lack of manpower; inadequate farm machinery may account for another 10%. . . . Secretary Wickard's plan to mobilize farm workers is visionary and quite impractical. . . .

Alabama—A very definite shortage of farm labor. . . . 20% (reduction) in Irish potatoes of Baldwin and Mobile counties. . . . Shortage of farm equipment, such as tractors and cultivators. . . .

Delaware—Farm machinery allotment is inadequate. . . . Labor-saving machinery . . . needed most. Production as a whole will be from 10 to 15% under 1942.

Florida—There is a definite demand for additional farm equipment such as tractors. . . . Manpower shortage is major factor. . .

Georgia—Expect almost 50% cut in production. . . . Several thousand less milk cows. . . . In South Georgia vegetable and truck crops will be reduced approximately one-third. . . .

Idaho—We know labor is scarcer, equipment is scarcer, and many farmers have left their farms to get into defense work, so how are we going to produce more in 1943 than in 1942? It is absolutely impossible unless the farmers are given some help. . . .

Illinois—A shortage of manpower, machinery, and threat of the corn borer and other insects seem to make it safe prediction that our production in Illinois will be less than in 1941 and 1942.

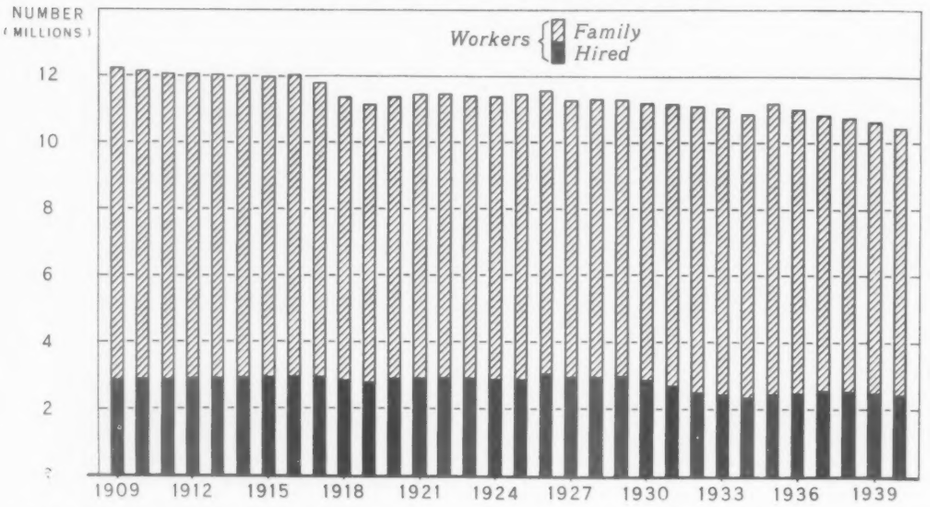
Iowa—The Iowa farmer will do all that he can with the equipment and labor that he has available. However, with the shortage of skilled labor, he will be very prone to cut the corners. Thus, it will be absolutely impossible for him to get the maximum amount of production that would be available were he able to do the best job . . . production will show an increase.

Kansas—Production . . . short 10% to 15%. Farm labor supply on Jan. 1 . . . was 43% (of demand). While we have no definite data on machinery as yet, wear and tear has taken its inevitable toll. . . . There will be 3600 Kansas farms idle in 1943 as compared to 900 the year before. . . .

Louisiana—Many farms in the various parishes have been stripped of so much of their help that the farms will not be self-sustaining, much less produce a surplus.

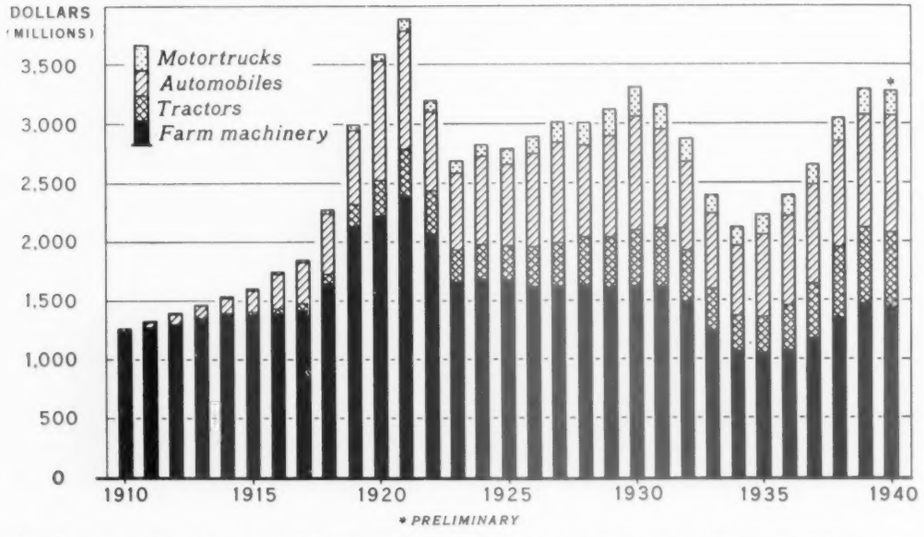
Maine—Have about 50% of our normal labor supply. . . . The young men who left the farms were the men who knew how to operate

NUMBER OF FAMILY AND HIRED WORKERS IN AGRICULTURE, UNITED STATES, 1909-40



The farm labor shown on this graph is the average for the years listed and the graph does not indicate July peaks or January lows. On July 1, hired help normally represents about 25% of the total; on January 1, 20%. Both family and hired workers are now being hit by the draft and a steady drain into war plants

VALUE OF AUTOMOBILES, MOTORTRUCKS, TRACTORS, AND OTHER FARM MACHINERY, JANUARY 1, 1910-40



Number of automobiles may fall off a little in 1943, but the value of those remaining on farms will increase the total to cover this decline, it is believed. Trucks are in the same category. Tractors will increase in value slightly with the 70,000 added by WPB's recent allotment of steel, although this will be offset slightly by the tractors discarded this year. Number discarded would normally be 100,000 out of the 1,900,000 on farms. But because of the shortage, it is likely no more than 50,000 will be discarded

our tractors and farm machinery, and keep that equipment in good mechanical condition. These men cannot be replaced.

Massachusetts—Just as the Washington statisticians guessed wrong on proteins, I believe they have guessed wrong on food production. I believe Massachusetts can meet her goals on eggs, if we can get fuel for brooders and proteins for the right feeds. . . .

Michigan—Crop acreage will be about 1% less in 1943. . . . Average age of farmers in Michigan . . . 53 years; . . . 30% farm labor shortage in 1943.

Minnesota—At least a 10% decrease in food production. . . .

Mississippi—About 20% to 25% (reduction). . . . Low prices . . . scarcity of farm machinery and farm labor . . . has caused many to seek other employment. The proposal to recruit city residents for farm labor will not relieve the situation. . . . Theoretical farming has never worked. . . .

Missouri—During 1942 there was a gradual withdrawal from the farms of skilled workers. . . . Replacement and repair of tractors will be reduced. Women, school boys and WPA men do not make competent farmers and stockmen.

Montana—Production goals of farm crops requiring farm machinery and not much labor will be met. . . . Doing everything possible to encourage maximum plantings. . . .

Nebraska—Shortage of competent labor. . . . Decrease (will be) 15% and might be more nearly 20%. The farm labor situation certainly will become increasingly grave as the planting season approaches and manpower is drained from the farms into military service and attracted to war industries by wages that are unjustified and indefensible.

Nevada—Some estimates are . . . at least 25% lower . . . depends on labor and machinery situation. . . . Not making any plans to increase their production during 1943 until some assurance given them that there will be ample labor to plant, care for and harvest farm crops.

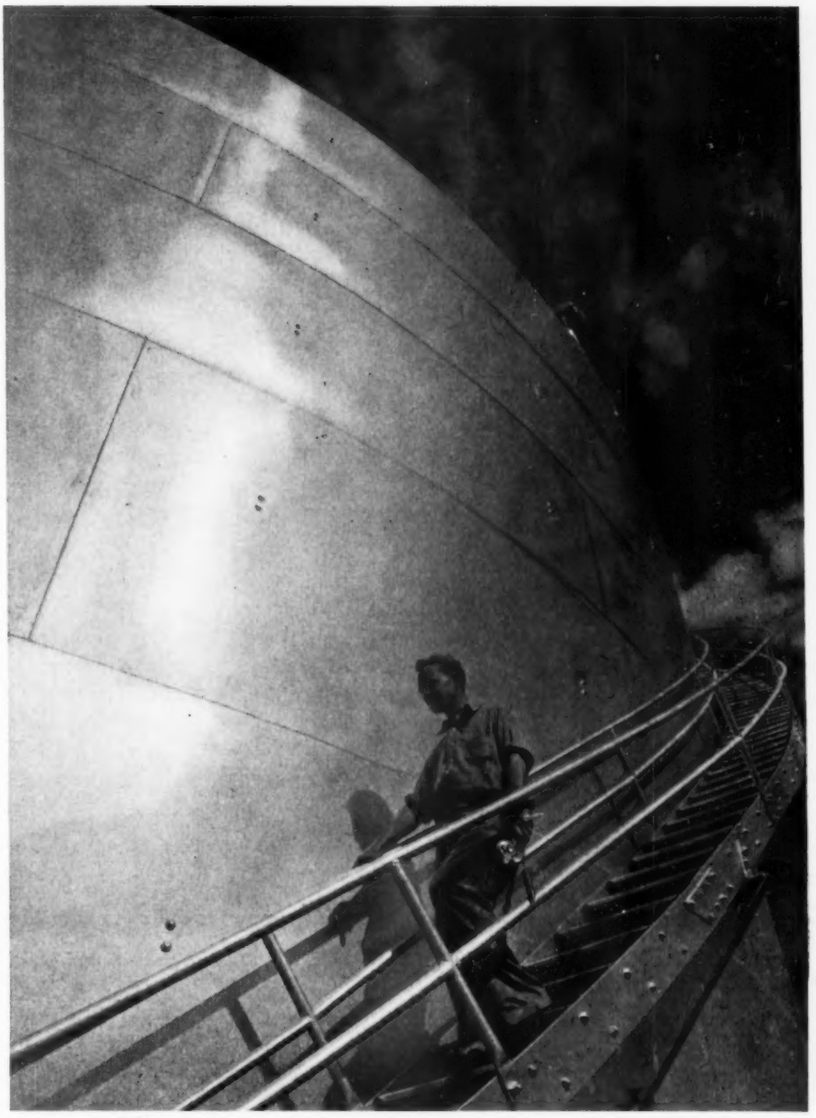
New Hampshire—Shortage of labor plus the inability to get supplies will tend to reduce materially their (commercial farms) normal production. . . .

New Mexico—More than one-half of the counties anticipate a shortage of farm machinery . . . difficulty in getting major repairs needed to machinery due to shortage of mechanics. General forecast of a reduction . . . 12% or 15% from 1942. . . .

New York—(Are making) efforts . . . to recruit additional farm labor. . . . The gradual wearing out of farm machinery without the prospect of being able to replace it with a sufficient degree of promptness will constitute a serious limiting factor upon the ability of New York state farmers to maintain food production. . . . Same acreage of crops will be planted in 1943. . . .

North Carolina—All indications point to a decided reduction in acreage. . . .

Ohio—Without machines this 15.4% of



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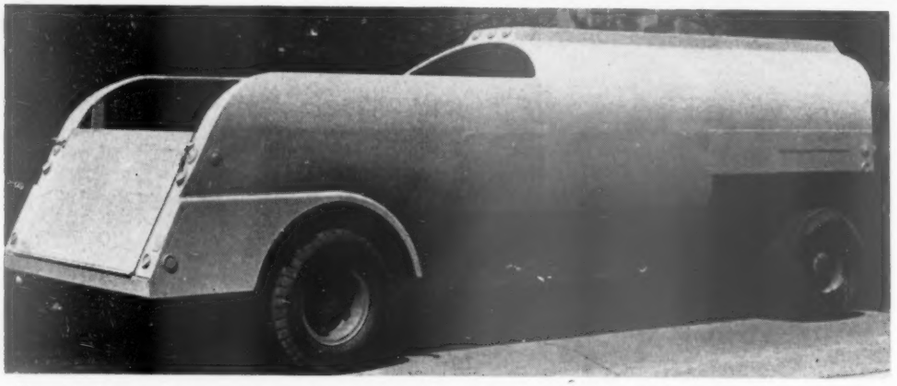

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Ohio's population on farms cannot maintain capacity production. . . . Despite repeated pleas of the Nation's farmers, they are not getting, and apparently will not get, the machine replacements they need to maintain production in the face of labor shortages becoming progressively worse. . . . Normal demand (in Ohio) for 15,000 tractor-drawn plows must be satisfied with 1150. . . .

Oklahoma—With the present labor and equipment shortage . . . there will be from 12 to 15% reduction in the food production in this state. . . .

Oregon—(Livestock and farm production generally normal.) Damage has been done to our agricultural production . . . by the drafting of farm labor. . . . Too many people have the idea that a farm laborer is not a skilled workman. . . . However, if we should take a college professor . . . put him out on a lonely mountainside with a band of 1200 or 1500 sheep, I am of the opinion that he would not find his ability to translate Latin of much use when the storm came. . . .

Rhode Island—Decrease of cow population of approximately 8% . . . increase in potato production.

South Dakota—Hardly possible to produce as large a crop as we did this year (1942). . . .

Tennessee—Good crops in apples, peaches, and pears . . . (but) a real labor deficiency.

Texas—Farms these days are largely mechanized and it is largely the operators of modern farm machinery who are mechanically inclined who have gone into the munition and industrial plants and they simply cannot be replaced. . . . Acreage planted to crops . . . will be 15% less.

Utah—(Drafting farm labor and disparity between industrial and farm wages) must be corrected immediately to prevent even further drastic reductions in food production.

Vermont—Unless practical and forceful measures are undertaken to provide . . . much more labor . . . result will be a marked decrease in production in 1943.

Virginia—At least a 15% decrease (due to shortage of labor, machinery and fuel).

Washington—Morale of the farmer is low and anything that can be done from a national standpoint to instill more confidence into the farmer regarding labor and machinery supplies necessary to harvest the crops should be done at once.

West Virginia—We will have 20% to 30% shortage of food production . . . unless something is done to remedy the labor shortage. . . . Why should the farmer work 80 to 100 hours a week to produce cheap food for the people who work in war munition and other factories 35 to 40 hours a week? . . .

Wisconsin—If we have normal weather, we should maintain the high levels obtained in 1942, providing serious manpower shortages can be avoided.

Wyoming—Short of farm and ranch labor here before the war ever started. I have consistently preached this to those in charge of Selective Service but they have paid but very little attention to my pleas, and even today they laugh at me and declare there is not shortage of farm labor in the state. . . .

COMING MEETINGS

MARCH

Oil-Heat Institute of America, Inc., Twentieth Annual, Hotel Commodore, New York City, Mon.-Tues., March 8-9.

Indiana Independent Petroleum Assn., Inc., Semi annual Convention, Hotel Severin, Indianapolis Ind. Wed.-Thurs., March 10-11.

Empire State Petroleum Assn., Inc., Annual Meeting, Syracuse, N. Y., Thurs., March 11.

Eastern States Gasoline Dealers Conference, New York, Sun., March 14.

APRIL

New Jersey Oil Trade Assn., Inc., Annual Spring Frolic, Robert Treat Hotel, Newark, N. J., Thurs., April 1.

American Assn. of Petroleum Geologists, 28th Annual Meeting, The Hotel Texas, Fort Worth, Texas, Tues.-Wed.-Thurs., April 7-8-9.

American Petroleum Institute, Division of Production, Eastern District, Wm. Penn Hotel, Pittsburgh, Pa., April 8-9.

American Chemical Society, Petroleum Division, Detroit, Mich., Mon.-Fri., April 12-16.

Natural Gasoline Association of America, Baker Hotel, Dallas, Texas, Wed.-Fri., April 14-16.

Independent Oil Men's Assn. of New England, 20th Annual Convention, Copley Plaza Hotel, Boston, Mass., Wed.-Thurs., April 21-22.

The American Society of Mechanical Engineers, Hotel Blackhawk, Davenport, Iowa, Fri.-Sun., April 26-27-28.

American Petroleum Institute, Division of Production, Rice Hotel, Houston, Texas, Thurs.-Fri., April 29-30.

MAY

Petroleum Industry Electrical Assn., Rice Hotel, Houston, Texas, Wed.-Thurs., May 5-6.

National Fire Protection Assn., Palmer House, Chicago, Ill., Mon.-Sat., May 10-11-12-13-14-15.

JUNE

The American Society of Mechanical Engineers, Hotel Biltmore, Los Angeles, Calif., Mon.-Wed., June 14-15-16.

New Jersey Oil Trade Assn., Inc., Spring Golf Outing, Suburban Golf Club, Elizabeth, N. J., Thurs., June 24.

OCTOBER

West Virginia Petroleum Assn., Annual Convention, Daniel Boone Hotel, Charleston, W. Va., Wed., Oct. 13.

Petroleum Division, National Assn. of Credit Men, St. Louis, Mo., Mon.-Wed., Oct. 25-26-27.

NOVEMBER

The American Society of Mechanical Engineers, New York, Mon.-Fri., Nov. 29-30, Dec. 1-2-3.

DECEMBER

Nebraska Petroleum Marketers, Inc., Fontenelle Hotel, Omaha, Tues.-Thurs., Dec. 7-8-9.

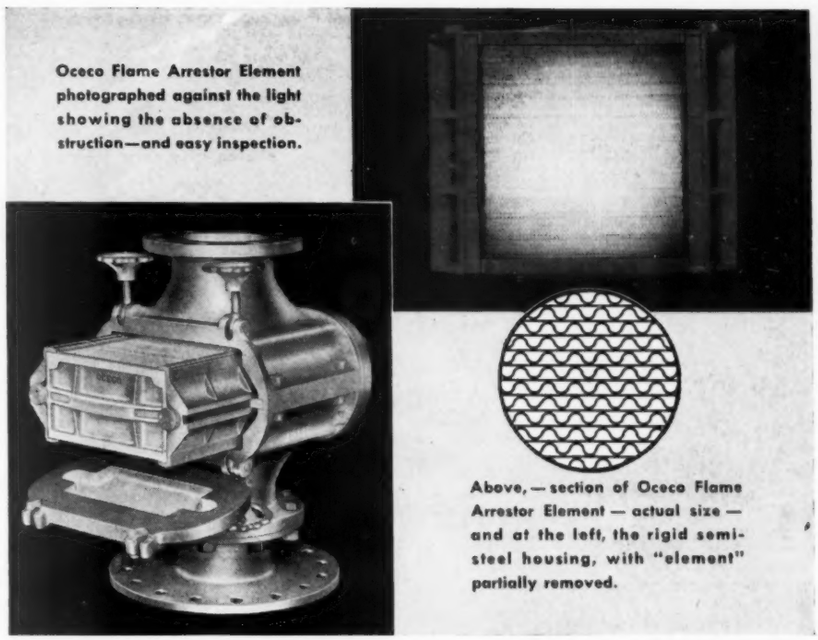
Time Rather Than Mileage Basis Urged by Car Engineers

NPN News Bureau

CLEVELAND — Change oil on a time rather than a mileage basis is recommendation of Studebaker engineers in a folder just issued to car owners.

The folder, entitled "How to Keep Your Car Healthy on a Rationed Diet", tells Studebaker owners to watch quantity and quality of oil in the crankcase, particularly since oil's function today can be seriously impaired by water due to condensation.

The folder also recommends that tire pressures be increased about 15% for 35 m.p.h. driving, and warns that batteries may be overworked and underfed because of slower driving, urging frequent charging.



Oceco Flame Arrestor Element photographed against the light showing the absence of obstruction—and easy inspection.

Above,—section of Oceco Flame Arrestor Element — actual size — and at the left, the rigid semi-steel housing, with "element" partially removed.

OCECO ***STRAIGHT THROUGH***
FLAME ARRESTOR PASSAGES

1. ***Positively prevent flame passage***
2. ***Permit free tank venting***
3. ***Minimize entrainment of condensates***
4. ***Assure easy quick inspection***

• As thousands of users know, Oceco Flame Arrestors give real protection. The corrosion-resisting "bank" or "element" assembled from flat and corrugated sheets of aluminum, arranged alternately to form vertical straight through passages is an absolute flame stop,—yet assures free tank breathing with minimum pressure drop. The entire absence of screens and tortuous channels minimizes entrainment of condensation, and clogging, avoiding "cave-ins" and "blow-outs",—and permits easy inspection simply by looking through. Rigid gas-tight semi-steel housings of Oceco Vent Units provide maximum protection against the heat of nearby fires, not afforded when housings of lower melting point material are used.

Our recently completed Catalog No. V-50 gives complete details . . . Send for a copy today!

OCECO

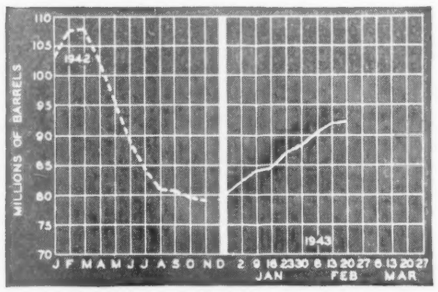
Division of
THE JOHNSTON & JENNINGS COMPANY
883 Addison Road · Cleveland, Ohio
Engineering and Sales Representatives in the Principal Cities

FIRE PREVENTION AND VAPOR CONSERVATION EQUIPMENT
FOR VOLATILE LIQUID STORAGE TANKS

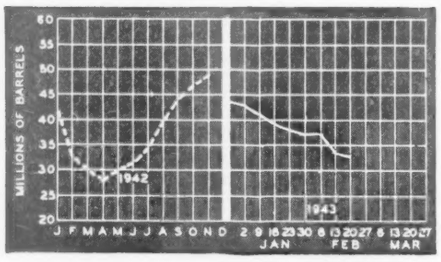
STATISTICS

Monthly figures are actual as reported by Bureau of Mines. Weekly figures are as estimated by American Petroleum Institute on Bureau of Mines basis, except crude stocks which are as reported by Bureau of Mines.

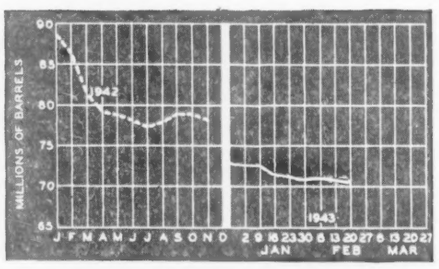
Gasoline Stocks (Finished & Unfinished)



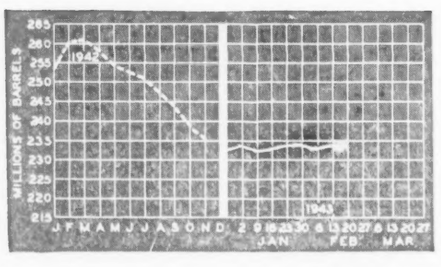
Gas Oil and Distillate Stocks



Residual Fuel Oil Stocks



Crude Stocks



Refinery Operations

(American Petroleum Institute figures in thousands of barrels of 42 gallons each. Figures include reported totals plus an estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Daily Potential Refining Capacity Week Ended Feb. 20	Feb. 13	Per Cent of Refining Capacity Reporting Week Ended Feb. 20	Feb. 13	Daily Average Crude Runs to Stills Week Ended Feb. 20	Feb. 13	Per Cent of Reporting Capacity Operated Week Ended Feb. 20	Feb. 13
Combined°°	2,444	2,444	88.7	88.2	1,667	1,562	68.2	63.9
Appalachian	177	177	84.8	84.8	152	148	85.9	83.6
Ind., Ill., Ky.	811	811	85.0	85.0	743	731	91.6	90.1
Okla., Kans., Mo.	416	416	80.1	80.1	345	351	82.9	84.4
Rocky Mt.	147	147	48.0	48.0	87	83	59.2	56.5
California	817	817	89.9	89.9	700	730	85.7	89.4
Total U. S.—B. of M. Basis	4,812	4,812	86.2	85.9	3,694	3,605	76.8	74.9
U. S.—B. of M. Feb. 21, 1942					3,876			

Districts	Gasoline Production at Refineries inc. Natural Blended Week Ended Feb. 20	Feb. 13	Stocks of Finished and Unfinished Gasoline Week Ended Feb. 20	Feb. 13	Total Stocks Gas Oil & Distillates Week Ended Feb. 20	Feb. 13	Total Stocks Residual Fuel Oil Week Ended Feb. 20	Feb. 13
Combined°°	4,566	4,739	39,838	40,254	15,637	16,094	10,394	10,629
Appalachian	405	434	3,017	3,016	666	686	574	586
Ind., Ill., Ky.	2,262	2,194	19,505	19,109	3,881	4,182	2,755	2,689
Okla., Kans., Mo.	1,068	1,117	7,569	7,520	1,516	1,386	1,385	1,385
Rocky Mt.	319	314	2,000	1,943	369	372	536	518
California	1,704	1,655	20,286	20,267	11,298	11,572	54,784	54,859
Total U. S.—B. of M. Basis	10,324	10,453	92,215°	92,109†	33,367	34,292	70,428	70,666
U. S.—B. of M. Basis Feb. 21, 1942	12,506		106,984		35,433		87,825	

°Finished 82,088,000 bbl.; Unfinished 10,127,000 bbl.
°°Includes East Coast, Inland Texas, Texas Gulf, Louisiana Gulf, and North Louisiana-Arkansas districts.
†Revised in Ind.-Ill.-Ky. district, due to inclusion of 204,000 bbl. of Unfinished Gasoline not previously reported.

Crude Oil Stocks

(Bureau of Mines Figures in thousands of barrels)

Grade or Origin	Feb. 13	Feb. 20	Change from Feb. 13
Pennsylvania Grade	2,925	2,866	— 59
Other Appalachian	1,351	1,313	— 38
Lima-Michigan	1,111	1,139	+ 28
Illinois-Indiana	9,731	10,097	+366
Arkansas	2,327	2,259	— 68
Kansas	7,735	7,823	+ 88
Louisiana:	12,316	12,397	+ 81
Northern	4,024	3,987	— 37
Gulf Coast	8,292	8,410	+118
Mississippi	1,616	1,563	— 53
New Mexico	6,414	6,623	+209
Oklahoma	38,042	37,411	—631
Texas:	104,243	104,454	+211
East Texas	25,101	24,861	—240
West Texas	23,402	24,111	+709
Gulf Texas	30,329	30,230	— 99
Other Texas	25,411	25,252	—159
Panhandle	5,024	4,896	—128
North	7,240	7,119	—121
South	4,554	4,394	—160
Other	8 593	8 843	+250
Rocky Mountain	13,806	13,824	+ 18
California	32,497	32,686	+189
Foreign	125	107	— 18
Total gasoline-bearing in U. S.	234 239	234,562	+323
Heavy in California	10,278	10,147	—131

N. P. N. Gasoline Index

	Dealer T.W.	Tank Car
	Cents Per Gal.	
Mar. 1	10.57	6.69
Month ago	10.57	6.70
Year Ago	10.17	6.73

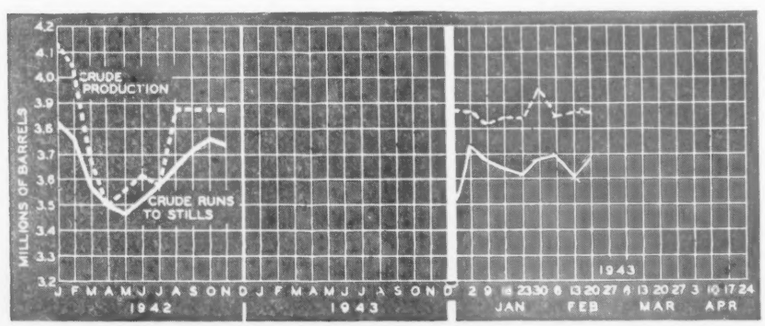
Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is a weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

Pennsylvania Crude Runs

(Compiled by National Petroleum Assn. from reports of all companies which refined Pennsylvania crude. Figures in barrels.)

Week Ended	Daily Average	Week Ended	Daily Average
Jan. 2	75,279	Feb. 6	67,494
Jan. 9	70,842	Feb. 13	69,103
Jan. 16	78,155	Feb. 20	78,797
Jan. 23	77,551	1942 Low	67,243
Jan. 30	74,034	1942 High	87,251

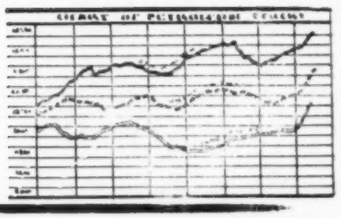

MILLIONS OF BARRELS
CRUDE PRODUCTION
CRUDE RUNS TO STILLS
1942
1943
J F M A M J J A S O N D J F M A M J J A S O N D 2 9 16 23 30 6 13 20 27 6 13 20 27 3 10 17 24
JAN FEB MAR APR

U. S. Crude Oil Production

(American Petroleum Institute figures)

	WEEK ENDED Feb. 20 Barrels (Daily Average)	Feb. 13 Barrels (Daily Average)		WEEK ENDED Feb. 20 Barrels (Daily Average)	Feb. 13 Barrels (Daily Average)
Oklahoma	347,700	352,600	Eastern (Ill. & Ind. excluded)	82,750	94,550
Kansas	316,650	299,850	Michigan	58,600	63,200
Nebraska	2,600	2,350	Wyoming	91,700	86,850
Texas	1,343,100	1,341,000	Montana	21,450	21,450
Louisiana	337,300	338,100	Colorado	7,100	7,250
Arkansas	75,250	75,700	New Mexico	96,600	96,600
Mississippi	55,000	56,900	California	780,000	773,500
Illinois	242,700	245,200			
Indiana	15,800	15,700	Total U. S.	3,874,300	3,870,800

Oil MARKETS



Pennsylvania

NEW YORK, Feb. 27—Western Penna. refiners advanced their quotations for kerosine and fuel oils 0.125c to 0.25c the past week as material continued very tight under heavy demand. One refiner withdrew his quotations for fuel oils, saying he had only limited material for steady customers at present.

In the upper field No. 1 fuel was priced 0.25c higher at 6.5-7.75c and No. 3 fuel was 0.125c higher at 6.375-7.75c.

All grades of kerosine and fuel oil were up 0.125c in the lower field, with new quotation ranges as follows: 6.5-7.625c for 45 w.w kerosine, 6.5-6.75c for 46 w.w, 6.625-6.75c for 47 w.w., 6.25-6.5c for No. 1 fuel, 6.25-7.125c for both Nos. 2 and 3 fuel, and 6.25-7c for 36-40 gravity fuel.

Quotations for gasoline and lube oils were unchanged. Mid-western sales agent who had been offering neutrals at 1c off said he now was offering at 2c off, but Penna. refiners held their quotations at published levels.

Gulf

NEW YORK, Feb. 27—Several Gulf Coast refiners reported changes in their gasoline quotations the past week, lowering the price of one grade, widening the range for another, and eliminating quotations for a third.

Cargoes of min. oct. (ASTM) gasoline were quoted 0.25c lower at 6c-6.9c when one refiner said he now was offering 10 lb. vapor pressure material at the 6c price. High of the quotation range for barge lots of 72-74 oct. (ASTM) leaded in the New Orleans and lower Mississippi market was advanced 0.375c to 6.125c when another refiner said he was quoting 6.125c on that grade for tank car and barge delivery. In the same market, price of 5.58c for tank car lots of 65 oct. (ASTM) unleaded was eliminated, with no refiners quoting on the grade.

Several sources remarked about the notable lack of light oils, particularly kerosine, and one refiner said he was "parcelling material out" to regular customers only.

Mid-Continent

TULSA, Feb. 27—Sustained heavy drain on fuel oil output and increased activity in bright stocks were outstanding developments reported in Mid-Continent markets the past week.

Most refiners said they had absolutely no kerosine or distillate fuels and were shipping daily production. Many said they had tried unsuccessfully to buy material to meet commitments. Entire output of residual fuel from most refineries was said to be going to railroads at direction of supplies and distribution committee, augmented by charge stocks from a number of refineries where cracking had been discontinued to decrease gasoline yields.

Refiners reported numerous inquiries for Mid-Continent bright stocks, and market was said to be "in better shape" than a few weeks ago.

No changes in prices were reported.

Atlantic Coast

NEW YORK, Feb. 27—Products shortages along the East Coast continued generally acute the last week of February, with suppliers anxious over possibility of new crises in the heating oil situation in the few remaining weeks of the season. Tightness of kerosine was said to be more noticeable than for any other product along the seaboard although the release of over 100,000 bbls. by the Navy "relieved in a measure" New York and New Jersey distress areas. Emergency cases in New England were also said to have been tided over by the arrival of large shipments of No. 2 fuel.

Gasoline, 72-73 oct., was priced 0.125c lower at New Orleans, at 6.125c to 6.75c, when supplier at that point reduced his prices for that grade and No. 2 fuel 0.125c. Range at New Orleans for the latter product was narrowed to 3.75c flat. Another supplier who had been quoting 6.375c for 72-74 oct. said he was no longer offering at that point.

CRUDE PRICES

No Crude Price Changes as of March 1

Since changes in crude oil prices are so few, the 2 pages of crude oil price tables hereafter will be printed only when there are sufficient changes in prices to warrant.

In the meantime a record is being kept in the Cleveland office of NPN and OILGRAM from which the publishers will be glad to make proofs, or letters or affidavits as to what the prices are, and without charge to regular subscribers. Changes in crude oil prices will be specially noted in this market section when made.

Mid-Western

CHICAGO, Feb. 27—Demand for fuel oils last week continued above what refiners and marketers were able to fill, they stated. Central Michigan reported gasoline demand was extremely strong in Central Michigan and one refiner said sales of Ethyl increased approximately 40% over previous ratio of Ethyl sales to regular. Mid-western refiners and marketers said gasoline sales had picked up slightly and expressed belief that an increase would be noted as farmers began to stock up. Some gasoline and tractor fuels sold for agricultural needs, they said, but farmers are not ordering as early as it was hoped they would.

Refiners and marketers stated they had opportunity to catch up on some delayed shipments at beginning of week. Transportation continues to be a serious problem, according to both mid-western and central Michigan refiners and marketers.

California

LOS ANGELES, Feb. 27—Little change is reported in the California market. Gasoline prices among the independent refiners were depressed as supplies continued in excess of demand. Extreme low for gasoline was 5.5c for Ethyl, 5c for regular, and 4.5c for third grade. Refiners reported that third grade was very difficult to move.

In the fuel oil market practically all sales are being made at the OPA ceiling price which is now the same as the major companies posted price. Even off-specification fuel oil is reported in demand and selling for only 2.5c under ceiling prices.

Index of Governmental Orders Concerning Petroleum Prices

Orders, "requests", "ceilings", and other statements issued by governmental agencies concerning prices of petroleum and products, prices for which are published in this market section of NATIONAL PETROLEUM NEWS, have been published as follows:

(For orders issued prior to December see earlier issues of NPN)

	NATIONAL PETROLEUM NEWS	PLATT'S OILGRAM	Platt's OIL-Law-GRAM
Dec. 26, '42—Service station 3c margin made nationwide	Dec. 30, p. 13	Dec. 28, p. 2	P. 272.33
Dec. 29, '42—Fuel oil price increase of .3c in rationed area	Jan. 6, p. 8	Dec. 28, p. 3	P. 300.81 P. 272.35
Dec. 29, '42—Aviation gasoline of 87 Octane and over exempt from price control	Jan. 6, p. 10	Dec. 29, p. 1	P. 300.85
Dec. 29, '42—Maximum prices set for light fuel oils in Boston area	Jan. 6, p. 11	Dec. 31, p. 1	P. 300.86 P. 272.37
Jan. 4, '43—Gasoline tank wagon price increase set for Quincy, Ill.	Jan. 6, p. 11	Jan. 5, p. 1	P. 300.91 P. 272.39
Jan. 4, '43—Residuals and distillates redefined; specific prices set at certain ports	Jan. 6, p. 15	Jan. 4, p. 1	P. 300.93
Jan. 4, '43—Maximum prices set for kerosine, light fuel oils in New York City	Jan. 20, p. 12	Jan. 6, p. 2	P. 300.96 P. 272.40
Jan. 4, '43—Specific prices set for Beverly Hills, Calif. crude	Jan. 13, p. 27	Jan. 6, p. 1	P. 301
Jan. 25, '43—Dollar and cents ceilings set for Western residuals	Jan. 27, p. 15	Jan. 25, p. 2	P. 300.99
Jan. 26, '43—Specific prices set for Pacific heavy fuels	Jan. 27, p. 8	Jan. 26, p 2	P. 300.103

REFINERY and SEABOARD PRICES

In bulk lots by Motor Transport, Tank Car, Barge or Tanker as shown

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

HOW PRICES ARE REPORTED—

Refinery and Seaboard prices in National Petroleum News are gathered by PLATT'S OILGRAM and are published in the Monday issue of the OILGRAM.

PLATT'S OILGRAM is a reporting service issued in three identical editions daily from News Bureaus at New York, Cleveland, and Tulsa, Okla. PLATT'S OILGRAM gathers and publishes what its publisher and representatives believe to be accurate news of sales, prices and current happenings affecting the oil industry and that will be of interest to its subscribers. As this information is usually private, OILGRAM reports it according to what it is able to obtain from sources deemed reliable.

All information is supplied without guarantee as to its completeness, accuracy, time of transmission or promptness of delivery.

The subscriber receives this information for his private use and not for resale or further distribution.

Publisher reserves the right to change the extent, nature and form of showing this information at any time.

Prices shown in the tables are quotations (meaning sellers' general offers or posted prices), or actual sales prices, reported to OILGRAM by refiners for "open spot" transactions, except as otherwise specified.

Prices arrived at by discounts off a specified price or "market date of shipment," prices named in contracts or prices arrived at in accordance with any arrangement made prior to date of sale, are not for "open spot" transactions and therefore are not considered in making the price tables. Prices made to brokers and prices in "Inter-refinery" transactions are also not considered except as may be noted.

All prices are for "immediate" shipment except in Gulf Coast bulk transactions where shipment is generally to be made in ninety days. Prices are FOB refineries, pipelines, or tanker terminals in districts designated.

Prices shown are for quantities in bulk such as tank car lots, motor transport lots or barge lots; and in cents per gallon; heavy fuel oils are in dollars per barrel of 42 U.S. gallons; wax and petrolatums are in cents per pound. Prices applying to barges or cargoes only are so designated.

Prices do not include taxes or inspection fees. Prices are published at the close of the business day.

Mid-Western prices in the tables were gathered from refiners with offices located in Chicago and the surrounding territory. While the prices are quoted on a Group 3 (Oklahoma) freight basis, this is in accordance with the custom of the oil industry which uses Group 3 as a price basis for the ease of comparing prices even when the material originates in another refining district. Other refinery prices are given by and for the particular refining district where the material is made and from which it is shipped.

When prices obtained by OILGRAM do not conform to these conditions the exception and the new conditions are noted in the news lead or in conjunction with the price table by footnote or otherwise, for the particular refinery or sales district involved.

Crude oil and products covered by OILGRAM'S news and price service, except where noted, have been represented to the publisher as fully up to the customary trade specifications indicated and according to the generally accepted methods of test; and all crude oil and all products thereof as having been lawfully produced and transported.

Any apparent error should be reported to the nearest OILGRAM or National Petroleum News office at once as no correction will be made after the second issue of the OILGRAM or National Petroleum News following its publication.

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads.

Summary of Daily Gasoline Prices (Feb. 22 to Mar. 1)

U. S. Motor, (ASTM octane) 78 octane Ethyl:	Monday Mar. 1	Friday Feb. 26	Thursday Feb. 25	Wednesday Feb. 24	Tuesday Feb. 23
Oklahoma	6.75 - 6.875	6.75 - 6.875	6.75 - 6.875	6.75 - 6.875	6.75 - 6.875
Mid-Western (Group 3 basis)	6.75 - 7.125	6.75 - 7.125	6.75 - 7.125	6.75 - 7.125	6.75 - 7.125
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6.6 - 7	6.6 - 7	6.6 - 7	6.6 - 7	6.6 - 7
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7 (2)	7 (2)	7 (2)	7 (2)	7 (2)
72-74 octane:					
Oklahoma	5.875- 6	5.875- 6	5.875- 6	5.875- 6	5.875- 6
Mid-Western (Group 3 basis)	5.875- 6	5.875- 6	5.875- 6	5.875- 6	5.875- 6
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.8 - 6	5.8 - 6	5.8 - 6	5.75 - 6	5.75 - 6
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6	6	6	6	6
63-66 octane:					
Oklahoma	5.5 - 5.625	5.5 - 5.625	5.5 - 5.625	5.5 - 5.625	5.5 - 5.625
Mid-Western (Group 3 basis)	5.5 - 5.625	5.5 - 5.625	5.5 - 5.625	5.5 - 5.625	5.5 - 5.625
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.4 - 5.5	5.4 - 5.5	5.4 - 5.5	5.4-5.625 (a)	5.4-5.625 (a)
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.75(1)	5.75 (1)	5.75 (1)	5.75(1)	5.75 (1)
60 octane & above:					
Oklahoma	5.125- 5.25	5.125- 5.25	5.125- 5.25	5.125- 5.25	5.125- 5.25
Mid-Western (Group 3 basis)	5.1 - 5.25	5.1 - 5.25	5.1 - 5.25	5.1 - 5.25	5.1 - 5.25
N. Tex. (For shpt. to Tex. & N.M. dest'ns.)	4.875- 5.25	4.875- 5.25	4.875- 5.25	4.875- 5.25	4.875- 5.25
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.25	5.25	5.25	5.25	5.25
Motor Gasoline, 72-74 octane (ASTM)					
New York harbor	9.2 -10.2	9.2 -10.2	9.2 -10.2	9.2 -10.2	9.2 - 10.2
New York harbor, barges	9.1 - 9.3	9.1 - 9.3	9.1 - 9.3	9.1 - 9.3	9.1 - 9.3
Philadelphia district	9.2 - 9.7	9.2 - 9.7	9.2 - 9.7	9.2 - 9.7	9.2 - 9.7
Baltimore district	8.95	8.95	8.95	8.95	8.95
Motor Gasoline:					
Western Penna. Bradford-Warren:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5-7.75 (2)	7.5-7.75 (2)	7.5-7.75 (2)	7.5-7.75 (2)	7.5-7.75 (2)
Western Penna. Other Districts:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.25 - 7.3	7.25 - 7.3	7.25 - 7.3	7.25 - 7.3	7.25 - 7.3

REFINERY PRICES

Gasoline—U. S. Motor (ASTM) except where otherwise specified

Prices in Effect	Mar. 1	Feb. 22
OKLAHOMA		
78 oct. Ethyl	6.75 - 6.875	6.75 - 6.875
72-74 oct.	5.875- 6	5.875- 6
63-66 oct.	5.5 - 5.625	5.5 - 5.625
60 oct. & below	5.125- 5.25	5.125- 5.25
60-62, 400 e.p.	5.125 (1)	5.125 (1)
MID-WESTERN (Group 3 basis)		
78 oct. Ethyl	6.75 - 7.125	6.75 - 7.125
72-74 oct.	5.875- 6	5.875- 6
63-66 oct.	5.5 - 5.625	5.5 - 5.625
60 oct. & below	5.1 - 5.25	5.1 - 5.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78 oct. Ethyl	6.6 - 7	6.6 - 7
72-74 oct.	5.8 - 6	5.8 - 6
63-66 oct.	5.4 - 5.5	5.4 - 5.5
60 oct. & below	4.875- 5.25	4.875- 5.25
60-62, 400 e.p.	5.375 (1)	5.375 (1)
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78 oct. Ethyl	7 (2)	7 (2)
72-74 oct.	6	6
63-66 oct.	5.75 (1)	5.75 (1)
60 oct. & below	5.25	5.25
CENT. W. TEX. (Prices to truck transports)		
80 oct. & above	7 (2)	7 (2)
72-74 oct.	5.875 (2)	5.875 (2)
67-69 oct.	5.375 (1)	5.375 (1)
62 oct. & below	5.125 (2)	5.125 (2)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
60 oct. & below	No Price	No Price
60-62, 400 e.p.	No Price	No Price
KANSAS (For Kansas destinations only)		
78 oct. Ethyl	7.25 (1)	7.25 (1)
72-74 oct.	6 -6.2 (2)	6 -6.2 (2)
63-66 oct.	5.625-5.8 (2)	5.625-5.8 (2)
60 oct. & below	5.25 -5.4 (2)	5.25 -5.4 (2)

Prices in Effect	Mar. 1	Feb. 22
ARK. (For shipment to Ark. & La.)		
72-74 oct., leaded	6 (1)	6 (1)
70-72 oct. "	5.875 (1)	5.875 (1)
62 oct. "	5.5 (1)	5.5 (1)
60 oct. & below, unleaded	5.375 (1)	5.375 (1)
WESTERN PENNA. (Motor gasoline)		
Bradford-Warren:		
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.5-7.75 (2)	7.5-7.75 (2)
Other districts:		
"Q" Gasoline Min. 70 Oct. (ASTM)	7.25 - 7.3	7.25 - 7.3
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor: (Oct. ASTM):		
72-74 oct.	8 - 8.5	8 - 8.5
67-69 oct.	7.5 (1)	7.5 (1)
Str. run gasoline, excluding Detroit shpt.	5.375- 6	5.25 - 6
OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances)		
72-74 oct.	8.375	8.375
CALIFORNIA U.S. Motor:		
78 oct. & above (Ethyl)	6 - 8.75	6 - 8.75
70-75 oct. (regular)	5.5 - 7.75	5.5 - 7.75
65 oct. & below (3rd grade)	4.5 - 6.75	4.5 - 6.75

Kerosine, & Gas Fuel Oils

Prices in Effect	Mar. 1	Feb. 22
OKLAHOMA		
41-43 grav. w.w.	4.375- 4.5	4.375- 4.5
42-44 grav. w.w.	4.5	4.5
Range Oil	4 - 4.125	4 - 4.125
No. 1 P.W.	3.875	3.875
No. 1 straw	3.875- 4 (1)	3.875- 4 (1)
No. 2 straw	3.625	3. 625
No. 3 fuel	3.5 (2)	3.5 (2)
U. G. I. Gas Oil	3.625-3.75 (1)	3.625-3.75(1)
No. 6 fuel	....	....
14-16 fuel	$0.97	$0.97
MID-WESTERN (Group 3 basis)		
41-43 grav. w.w.	4.375	4.375
42-44 grav. w.w.	4.5	4.5 (2)
Range Oil	4	4
No. 1 p.w.	3.875 (1)	3.875 (1)
No. 2 straw	3.625	3.625
No. 3	3.5	3.5
No. 5	$0.85 (1)	$0.85 (1)
No. 6	$0.80 (1)	$0.80 (1)
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
41-43 grav. w.w.	4.25- 4.75	4.25 - 4.75
No. 1 P.W.	4.1 -4.2 (2)	4.1 -4.2(2)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
41-43 grav. w.w.	No Price	No Price
No. 1 straw	No Price	No Price
KANSAS (For Kansas destinations only)		
41-43 grav. w.w.	No Price	No Price
42-44 grav. w.w.	4.7 -4.875(2)	4.7 -4.875 (2)
No. 1 p.w.	4.1 -4.25 (2)	4.1-4.25 (2)
No. 6 fuel	$0.85 (1)	$0.85 (1)

REFINERY PRICES (Continued)

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads.

Kerosine, & Gas Fuel Oil

(Cont'nued)

Prices in Effect	Mar. 1	Feb. 22
ARK. (For shipment to Ark. and La.)		
41-43 grav. w.w.	4.625 (1)	4.625 (1)
No. 1	4 (1)	4 (1)
No. 2	3.5 (1)	3.5 (1)
No. 3 fuel	3.5 (1)	3.5 (1)
Tractor fuel, for shpt. to Ark. points only	5.125 (1)	5.125 (1)
WESTERN PENNA.		
Bradford-Warren:		
45 grav. w.w.	6.25 – 7.75	6.25 – 7.75
46 grav. w.w.	6.375 (1)	6.375 (1)
No. 1 fuel	6.25 – 7.75	6.25 – 7.75
No. 2 "	6.25 – 7.625	6.25 – 7.625
No. 3 "	6.25 – 7.75	6.25 –7.75
36-40 gravity	6.25 – 6.5	6.25 –6.5
Other districts:		
45 grav. w.w.	6.5 – 7.625	6.375– 7.625
46 grav. w.w.	6.5 – 6.75	6.375– 6.75
47 grav. w.w.	6.625– 6.75	6.5 – 6.75
No. 1 fuel	6.25 – 6.5	6.125– 6.5
No. 2 "	6.25 – 7.125	6.125– 7.125
No. 3 "	6.25 – 7.125	6.125– 7.125
36-40 grav., Pittsburgh dist. prices excluded	6.25 – 7	6.125– 7
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
47-49 gravity w.w.	5.8 – 6	5.8 – 6
P.W. Distillate	5.5	5.5
No. 3 gas oil, Straw	5	5
U.G.I. gas oil	4.5 (1)	4.5 (1)
Fuel Oils (Vis. at 100).		
300-500 Vis.	....	....
100-300 Vis.	4.5	4.5
OHIO (S. O. quotations for statewide delivery)		
Kerosine	7	7
CALIFORNIA		
40-43 grav. w.w.	4.5 – 7	4.5 – 7
San Joaquin Valley:		
Heavy fuel	$0.85 (2)	$0.85(2)
Light fuel	$0.95 (2)	$0.95 (2)
Diesel fuel	4 (2)	4 (2)
Stove dist.	3 – 5 (2)	3 – 5 (2)
Los Angeles:		
Heavy fuel	$0.80–0.85 (2)	$0.80–0.85 (2)
Light fuel	$0.85–0.95 (2)	$0.85–0.95 (2)
Diesel fuel	3 – 5 (2)	3 – 5 (2)
Stove dist.	3 – 5 (2)	3 – 5 (2)
San Francisco:		
Heavy fuel	$0.90 (1)	$0.90 (1)
Light fuel	$1.00 (1)	$1.00 (1)
Diesel fuel	4.5 (1)	4.5 (1)
Stove dist.	5.5 (1)	5.5 (1)

Note: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

WESTERN PENNA.

Prices are for sales made, or offers reliably reported, to jobbers & compounders only.

Viscous Neutrals—No. 3 col. Vis. at 70°F.

200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	31.5 (1)	31.5 (1)
10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	23–26 (b)	23–26 (b)
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	29.5 (1)	29.5 (1)
10 p.t.	28.5 (1)	28.5 (1)
15 p.t.	27.5 (1)	27.5 (1)
25 p.t.	21–24 (b)	21–24 (b)

(b) Offered by Mid-Western sales agent at 1c off low.

Cylinder Stocks

Brt. stk., 145-155 vis. at 210°, 540-550 fl., No. 8 col.		
10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	25	25
600 S.R. filterable	15	15
650 S.R.	15.5	15.5
600 fl.	16	16
630 fl.	17	17

MID-CONTINENT (F. o. b. Tulsa)

Neutral Oils (Vis. at 100° F. 0 to 10 P.P.)

Pale Oils:

Vis. Color		
60-85—No. 2	8	8
86-110—No. 2	8.5 (2)	8.5(2)
150—No. 3	14.5	14.5
180—No. 3	15	15
200—No. 3	15	15
250—No. 3	16–16.5	16–16.5
280—No. 3	17	17
300—No. 3	18 (2)	18(2)

Lubricating Oils (Cont'd)

Prices in Effect	Mar. 1	Feb. 22
Red Oils:		
180—No. 5	15 (1)	15 (1)
200—No. 5	15 (1)	15 (1)
280—No. 5	No Price	No Price
300—No. 5	17.5 (2)	17.5 (2)

Note: Viscous Neutrals, 15-25 p.p. generally are quoted 0.5c under 0-10 p.p. oils. Non-viscous oils, 15-25 p.p.; generally are quoted 0.25c under 0-10 p.p. oils.

Bright Stock—Vis. at 210°		
200 Vis. D	27 (1)	27 (1)
150-160 Vis. D:		
0 to 10 p.p.	23	23
10 to 25 p.p.	22.5–23	22.5–23
25 to 40 p.p.	23 (1)	23 (1)
150-160 Vis. E	22 (1)	22 (1)
120 Vis. D:		
0 to 10 p.p.	22 (2)	22 (2)
600 S.R. Dark Green	8.5 (1)	8.5 (1)
600 S.R. Olive Green	10–11	10–11
631 S.R.	18.5 (1)	18.5 (1)
Black Oil	5.5 (1)	5.5 (1)

QUALIFYING PRICE NOTE: This note qualifies Mid-Continent Bright and Lube prices herewith. Refiners admit these tables show only their "posted prices" and that they make discounts from these in varying amounts depending on location of buyer and degree of competition of from 2c to 3½c on Bright Stock and upwards of 2c on neutrals. Discounts are made for immediate sale as well as for contracts. Some buyers report these discounts as high as 5c on bright and 3½c on neutrals but have not submitted written evidence.

SOUTH TEXAS Neutral Oils

Vis. Color		
Pale Oils: (*Vis. at 100°F.*)		
100 No. 1½-2½	6.5	6.5
200 No. 2-3	8.75	8.75
300 No. 2-3	9.25	9.25
500 No. 2½-3½	10	10
750 No. 3-4	10.25	10.25
1200 No. 3-4	10.375	10.375
2000 No. 4	10.5	10.5
Red Oils:		
100 No. 5-6	6.5 (2)	6.5 (2)
200 No. 5-6	8.75	8.75
300 No. 5-6	9.25	9.25
500 No. 5-6	10	10
750 No. 5-6	10.25	10.25
1200 No. 5-6	10.375	10.375
2000 No. 5-6	10.5–11.5	10.5–11.5

CHICAGO (F.om Mid-Continent p.l. crude.)

Neutral oils (Vis. at 100° F. 0 to 10 p.p.)

Pale Oils

Vis. Color		
60-85—No. 2	9.5 (1)	9.5 (1)
86-110—No. 2	10 (1)	10 (1)
150—No. 3	15.5 (1)	15.5 (1)
180—No. 3	16 (1)	16 (1)
200—No. 3	16 (1)	16 (1)
250—No. 3	17	17
Red Oils:		
180—No. 5	16 (1)	16 (1)
200—No. 5	16 (1)	16 (1)
250—No. 5	17 (1)	17 (1)
280—No. 5	18 (1)	18 (1)
300—No. 5	18.5 (1)	18.5 (1)

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined: (Viscosity at 210°)		
140	11.5 (1)	11.5 (1)
160	12.5 (1)	12.5 (1)
200	13.5 (1)	13.5 (1)
Bright stocks, 160 vis. at 210 No. 8 color:		
0 to 10 p.p.	24 (1)	24 (1)
15 to 25 p.p.	23.5 (1)	23.5 (1)
30 to 40 p.p.	21.5 (1)	21.5 (1)
E filtered Cyl. Stock	15.5 (1)	15.5 (1)

Note: To obtain prices delivered in Chicago, add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	3.875 (Qtns.)	3.875 (Qtns.)
FOB BRECKENRIDGE		
Grade 26-70	3.5 (Qtns.)	3.5 (Qtns.)
CALIFORNIA (FOB plants in Los Angeles basin)		
21 pound vapor pressure for blending	4.75 – 5.375	4.75 – 5.375

Naphtha and Solvent

Prices in Effect (FOB Group 3)	Mar. 1	Feb. 22
Stoddard solvent	6.625	6.625
Cleaners' naphtha	7.125	7.125
V. M. & P. naphtha	7.125	7.125
Mineral spirits	6.125	6.125
Rubber solvent	7.125	7.125
Lacquer diluent	7.375– 8.125	7.375– 8.125
Benzol Diluent	8.375– 8.625	8.375– 8.625
WESTERN PENNA.		
Bradford-Warren District:		
Stoddard Solvent	7.5 (1)	7.5 (1)
Other Districts:		
Untreated naphtha	7 (2)	7 (2)
Stoddard solvent	7 – 7.25	7 – 7.25
OHIO (S. O. quotations for statewide delivery): V.M.&P. naphtha, D.C. naphtha, Varnolene & Sobio solvent	10	10
Rubber solvent	9	9

Wax

White Crude Scale:

WESTERN PENNA. (Bbls. C.L.)		
122-124 A.m.p.	4.25 (2)	4.25 (2)
124-126 A.m.p.	4.25	4.25
OKLAHOMA (C.L., FOB Refinery)		
Semi-refined:		
128 AMP min., white, 50 kilo bags	No Price	No Price
132-134 AMP, bbls.	5.25 (1)	5.25 (1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)		
Snow White	6.125– 7.25	6.125– 7.25
Lily White	5.375– 6.125	5.375– 6.125
Cream White	4.375– 5.125	4.375– 5.125
Light Amber	3.375– 3.875	3.375– 3.875
Amber	3.125– 3.5	3.125– 3.5
Red	3 – 3.25	3 – 3.25

Group 3 Freight Rates

To Division Headquarters Points of Standard Oil Co. of Indiana (Cents Per Gal.)

	Gasoline Kerosine	*Distillate Fuel Oil	Gas Oil and or Residual Fuel Oil
Chicago, Ill.	2.508	2.508	2.516
Decatur, Ill.	2.244	2.244	2.442
Joliet, Ill.	2.508	2.508	2.516
Peoria, Ill.	2.310	2.310	2.442
Quincy, Ill.	2.178	2.178	2.294
Indianapolis, Ind.	2.640	3.034	3.034
Evansville, Ind.	2.442	2.886	2.886
South Bend, Ind.	3.135	3.135	3.330
Detroit, Mich.	4.290	3.996	3.996
Grand Rapids, Mich.	3.828	3.828	3.922
Saginaw, Mich.	4.290	4.144	4.144
Green Bay, Wis.	2.838	2.838	3.182
Milwaukee, Wis.	2.706	2.706	2.738
La Crosse, Wis.	2.574	2.574	2.886
Minneapolis-St. Paul	2.574	2.574	2.886
Duluth, Minn.	2.838	2.838	3.256
Mankato, Minn.	2.574	2.574	2.886
Des Moines, Ia.	2.046	2.046	2.294
Davenport, Ia.	2.310	2.310	2.442
Mason City, Ia.	2.376	2.376	2.664
St. Louis, Mo.	2.046	2.046	2.072
Kansas City, Mo.	1.518	1.518	1.776
St. Joseph, Mo.	1.518	1.518	1.776
Fargo, N. D.	3.564	3.564	3.996
Huron, S. D.	3.036	3.036	3.330
Wichita			
From Ponca City	0.528	0.528	0.592
From Tulsa	0.858	0.858	0.962
From Cushing	0.792	0.792	0.888

*Not suitable for illuminating purposes.

SEABOARD PRICES EXPORT AND COASTWISE

(NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.)

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher from others. Refiners' prices and sales shown; bids reported in market leads

Atlantic Coast

(Prices are of refiners, FOB their refineries & their tanker terminals, & of tanker terminal operators FOB their terminals)—Prices In Effect Mar. 1

MOTOR GASOLINE

District:	Min. 80 Oct. '39 Research (Max. 2 cc Lead)	72-74 Oct. (ASTM)	68-70 Oct. (ASTM)
N. Y. Harb.	....	9.2 – 9.4	9.2 (1)
N. Y. Harb., barges	....	9.1 – 9.3	9.1 (1)
Albany	....	9.3 – 9.5	....
Philadelphia	....	9.2	....
Baltimore	....	8.95	8.85 (1)
Norfolk	....	8.7	8.5 (1)
Wilmington, N. C.	....	8.7 – 8.75	8.5 (1)
Charleston	....	8.7 (2)	8.1 (1)
Savannah	....	8.25–8.4 (2)	....
Jacksonville	....	8.275 (1)	....
Miami	....	....	....
Tampa	....	8.27– 8.4	8.275 (1)
Pensacola	....	7 –7.2 (1)	6.6 –6.8 (1)
Mobile	....	7 – 7.2	6.6 –6.8 (1)
New Orleans	....	6.125– 6.75	....
Portland	....	9.5 – 9.65	....
Boston	....	9.4 – 9.7	9.7 (1)
Providence	....	9.4 – 9.7	....

FUEL OILS

	KEROSINE and/or NO. 1 FUEL	No. 2	No. 3	No. 5	No. 6
N. Y. Harb.	6.8	6.7	6.7	$1.95–2.10 (a)	$1.65
N. Y. Harb., barges	6.7	6.6	6.6	....	....
Albany	7	6.8	6.8 (2)	$2.25 (1)	$1.85 (1)
Philadelphia	6.9	6.7	6.7	$1.98	$1.65
Baltimore	6.9	6.7	6.7	....	$1.65
Norfolk	6.8	6.7	6.7 (1)	....	$1.65 (2)
Wilmington, N. C.	6.75	6.7	....	....	....
Charleston	6.9	6.7 (2)	....	....	$1.60 (2)
Savannah	6.75 (1)	....	....	....	$1.60 (1)
Jacksonville	6.75 (2)	6.25	....	....	$1.60 (1)
Miami	6.75 (1)	....	....	....	....
Tampa	6.75	6.25 (2)	....	....	$1.50 (1)
Pensacola	4.8 (1)	....	....	....	....
Mobile	4.75 (2)	....	....	....	....
New Orleans	4.25 – 4.5	3.75 (2)	....	$1.25 (1)	$0.85 (1)
Portland	7	6.8	6.8 (2)	$2.25 (1)	$1.65 (1)
Boston	6.9	6.7	6.7 (2)	$1.95 (2)	$1.65
Providence	6.9	6.7	6.7 (2)	$1.90–$1.95 (2)	$1.65

(a) This price is for a straight-run low pour test No. 5 fuel.

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. Harbor	$1.65	$2.78	6.7–6.8 (2)	6.8 (2)
Albany	$1.85 (1)	$2.98 (1)	6.8 (1)	7 (1)
Philadelphia	$1.65	$2.78	....	....
Baltimore	$1.65	$2.78	6.7 (1)	6.7 (1)
Norfolk	$1.65	$2.78	6.7 (1)	6.7 (1)
Charleston	$1.60	$2.78 (2)	6.7 (1)	6.7 (1)
Savannah	$1.60 (1)	$2.62 (1)	....	....
Jacksonville	$1.60 (2)	$2.62 (2)	....	....
Tampa	$1.50 (2)	$2.62 (2)	....	....
New Orleans	$0.85 (2)	$1.65 (1)	4 (1)	....
Portland	$1.65 (1)	$2.86 (2)	6.8 (1)	6.9 (1)
Boston	$1.65	$2.78	6.7 (2)	6.8 (2)
Providence	$1.65	$2.78 (2)	6.7 (1)	6.8 (1)

Pacific Export

(Quotations at seaboard, Los Angeles, cargo lots, except where otherwise noted.)

Prices in Effect	Mar. 1	Feb. 22
375 e.p. blend, 70 oct.	No Price	No Price
390 e.p. blend, 68 oct.	No Price	No Price
390 e.p. blend, 66 oct.	No Price	No Price
400 e.p. blend, 65 oct. min.	No Price	No Price
U. S. Motor, under 65 oct.	No Price	No Price
38-40 grav., w.w kero., 150 fire point	No Price	No Price
41-43 grav., w.w. kero.	No Price	No Price
44 grav. w.w. kero.	No Price	No Price
Diesel fuel, 24 & above	No Price	No Price
Diesel fuel, under 24	No Price	No Price
30-34 grav. diesel (gas oil) Pac. Spec. 200	No Price	No Price
Grade C fuel, Pac. Spec. 400	No Price	No Price
In Ship's Bunkers, or deep tank lots:		
Diesel Fuel, Pac. Spec. 200	$1.40 –$1.45	$1.40 –$1.45
Grade C fuel, Pac. Spec. 400	$0.825–$0.85	$0.825–$0.85
Cased Goods: (Per case)		
375-400 e.p. blend, 65 oct. & above	No Price	No Price
400 e.p. blend under 65 oct.	No Price	No Price
U. S. Motor	No Price	No Price
40-43 grav., w.w. kero., 150 fire point	No Price	No Price
Kero., p.w.	No Price	No Price

MID-CONTINENT LUBES

(At Gulf; in packages, FAS.; in bulk, FOB terminals)

Prices in Effect Mar. 1

	Steel Drums	Bulk
200 Vis. D 210 brt. stock	35 (1)	28.8 (1)
150 vis. D 210 brt. stock 0-10 p.p.	31 (1)	24.8 (1)
10-25 p.p.	....	....
100 vis D 210 brt. stock 0-10 p.p.	....	....
10-25 p.p.	....	....
200 vis. No. 3 col. neutral: 0-10 p.p.	....	....

Wax

(Melting points are AMP, 3° higher than EMP. Prices are FOB refinery and do not include bag, freight or export differentials).

Prices In Effect Mar. 1

Crude Scale	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25 (1)	....	4.25 (1)
122-4 White	....	4.25 (2)	4.25 (2)
124-6 White	4.25 (1)	4.25	4.25
Fully Refined:			
123-5	5.2 (1)	5.2 (2)	5.2 (1)
125-7	5.2 (1)	5.2 (2)	5.2 (1)
128-30	5.6 (1)	5.6	5.6 (1)
130-32	5.85 (1)	5.85 (2)	5.85 (1)
133-5	6.15 (1)	6.15	6.15 (1)
135-7	6.4 (1)	6.4 (1)	6.4 (1)

Tanker Rates

(Approximate last paid rates, cents per bbl.; Gulf-N. Atlantic, not East of N. Y.)

Hvy. Crude & Fuel (10 to 19.9 gravity)	48
Light Crude, (30 grav. or Lighter)	43
Gasoline	40
Kerosine	40
No. 2 Fuel	42

Note: 200% surcharge permitted on above rate by War Shipping Administration "to cover increased war-time operating expenses."

Gulf Coast

Prices in Effect Mar. 1

	New Orleans & Lower Mississippi to Baton Rouge		Texas Gulf Coast South of New Orleans		CARGOES Domestic & Export From all Gulf Ports
MOTOR GASOLINE	Tank Cars	Barge	Tank Cars	Barges	
Leaded (oct. by ASTM)					
80 oct. min. Max. 3 cc lead	6.25 – 7	....	6.25 – 6.9	6.75 – 6.9	6.25 – 6.9
72-74 oct.	6.125	5.75 – 6.125	5.75	5.75	5.75
63-65 oct.	....	....	5.35	5.35	5.35
Unleaded 70 oct.	....	....	....	....	5.5 – 5.625
67-68 oct.	....	....	....	....	5.25 – 5.625
65 oct.	....	5.25	....	....	5.125
60 oct.	....	....	....	....	5
KEROSINE & LIGHT FUELS					
41-43 w.w. kero.	3.875– 4.5	3.875	3.875– 4	3.875	3.875
42-44 w.w. kero.	....	....	3.875– 4	3.875	3.875
No. 2 fuel oil	3.75	3.75	3.75 – 3.81	3.75	3.75
DIESEL & GAS OILS (In diesel index No.)					
Below 43 di.	....	....	....	....	3.75
43-47 di.	....	....	....	....	3.875
48-52 di.	4.125	4.125	4	4	3.875– 4
53-57 di.	....	....	4.125	4.125	4
58 and above	....	....	....	....	4.25

Above products in Truck Transports of 2,400 gal. and over ½c above Tank Car Prices.

Naphtha

Prices in Effect Mar. 1

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor	11 (2)	10
Philadelphia district	11 (2)	10
Baltimore	10.5 (2)	9.5
Boston	11.5 (2)	10.5
Providence	11.5 (1)	10.5 (2)

HEAVY FUELS & BUNKER OILS (At all Gulf Ports)	In Cargoes	In Ship's Bunkers (Ex. lighterage)
Heavy Diesels		
Below 28 API Grav.	....	....
28 API Grav. & Above	....	$1.65
Bunker C Oil	$0.85	$0.85

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect March 1, 1943 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

S. O. New Jersey

Esso (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
*Atlantic City, N. J.	10.2	10.7	4.5	9.7
*Newark, N. J.	10.2	10.7	4.5	9.7
Annapolis, Md.	10.55	11.05	5.5	11.5
Baltimore, Md.	9.95	10.45	5.5	10.5
Cumberland, Md.	11.35	11.85	5.5	12.0
Washington, D. C.	10.2	10.7	4.5	11.0
Danville, Va.	11.65	12.15	6.5	12.25
Norfolk, Va.	10.45	10.95	6.5	12
Petersburg, Va.	10.75	11.25	6.5	13
Richmond, Va.	10.75	11.25	6.5	13
Roanoke, Va.	11.95	12.45	6.5	12.5
Charleston, W. Va.	12.25	12.75	6.5	13.3
Parkersburg, W. Va.	11.55	12.05	6.5	13
Wheeling, W. Va.	11.55	12.05	6.5	13.6
Charlotte, N. C.	12.1	12.6	7.5	11.3
Hickory, N. C.	12.65	13.15	7.5	12.3
Mt. Airy, N. C.	12.5	13.0	7.5	11.5
Raleigh, N. C.	11.85	12.35	7.5	12.3
Salisbury, N. C.	12.15	12.65	7.5	12.7
Charleston, S. C.	10.95	11.45	7.5	....
Columbia, S. C.	11.8	12.3	7.5	....
Spartanburg, S. C.	12.5	13.0	7.5	....

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	No. 1	No. 2	No. 3
Atlantic City, N. J.	9.7	9	9
Newark	9.7	9	9
Annapolis, Md.	...	9 25	...
Baltimore	9.5	9	9
Washington, D. C.	10	9.4	9.4
Norfolk, Va.	9.7	8.8	8.8
Petersburg	10	9	...
Richmond	10	9	9
Charlotte, N. C.	10.3	10.4	...
Hickory, N. C.	....	10	...
Raleigh	11.3	10.1	...
Charleston, S. C.	....	9	...
Columbia	....	10	...
Spartanburg	....	10.8	...

*Effective Aug. 5, '42 minimum retail resale price of 14.2c posted thru New Jersey.

Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Kerosine—1c off t.w. price for 25 gals. or more, under contract thru territory (Baltimore city contract not necessary) except no discount in state of New Jersey.

Naphthas—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

Socony-Vacuum Oil Co., Inc.

Socony Mobilgas (*Regular Grade*)

New York City	Com. Cons. T.W.	Undiv. Dlr. T.W.	Gasoline Taxes
Manhattan & Bronx	10.1	10.6	*5.5
Kings & Queens	10.1	10.6	*5.5
Richmond	9.7	10.2	*5.5
Albany, N. Y.	9.9	10.4	5.5
Binghamton, N. Y.	11	11.5	5.5
Buffalo	10.2	10.7	5.5
Jamestown, N. Y.	10.4	10.9	5.5
Mt. Vernon, N. Y.	10.1	10.6	5.5
Plattsburg, N. Y.	11	11.5	5.5
Rochester, N. Y.	10.8	11.3	5.5
Syracuse, N. Y.	10.5	11	5.5
Bridgeport, Conn.	10	10.5	4.5
Danbury, Conn.	10.5	11	4.5
Hartford, Conn.	10.6	11.1	4.5
New Haven, Conn.	10	10.5	4.5
Bangor, Me.	10.7	11.2	5.5
Portland, Me.	10.3	10.8	5.5
Boston, Mass.	9.9	10.4	4.5
Concord, N. H.	11.4	11.9	5.5
Lancaster, N. H.	12	12.5	5.5
Manchester, N. H.	11.3	11.8	5.5
Providence, R. I.	10	10.5	4.5
Burlington, Vt.	10.9	11.4	5.5
Rutland, Vt.	11	11.5	5.5

	Mineral Spirits T.W.	V.M.&P. T.W.
Buffalo, N. Y.	12.4	13.6
New York City	11	12
Rochester, N. Y.	13.2	14.4
Syracuse, N. Y.	14	....
Boston, Mass.	12	13
Bridgeport, Conn.	†16.3	†17.3
Hartford, Conn.	†16.3	†17.3
Providence, R. I.	13	14

	Kerosine Yard	Kerosine TW	Mobilfuel Diesel TC	Mobilfuel Diesel TW	Mobilheat Fuel Yard	Mobilheat Fuel TW
New York:						
Manhat'n & Bronx	7.1	10	...	9.3	7	9
Kings & Queens	7.1	10	...	9.3	7	9
Richmond	7	10	...	...	6.9	8.8
Albany	7.2	9.5	7	9.3	7	9
Binghamton	8.6	10.9	...	10.7	8.4	10.2
Buffalo	8.3	10.6	8	10.3	8.2	10
Jamestown	8.4	10.7	...	10.6	8.3	10
Mt. Vernon	7.2	10	...	9.4	7.1	9
Plattsburg	7.8	10.1	...	9.9	7.6	9.4
Rochester	8.4	10.7	7.9	10.2	7.9	9.7
Syracuse	8.2	10.5	7.8	10.1	7.8	9.6
Conn.:						
Bridgeport	7.3	9.6	...	...	7.2	8.8
Danbury	7.8	10.1	...	...	7.5	8.8
Hartford	7.4	9.7	...	9.5	7.2	9
New Haven	7.1	9.4	...	9.3	7	8.9
Maine:						
Bangor	7.6	9.9	7.4	9.7	7.4	9.1
Portland	7.2	9.9	7	9.3	7	9
Mass.:						
Boston	7.5	10.3	6.9	9.2	7.1	9
N. H.:						
Concord	8.1	10.4	...	...	8.2	10
Lancaster	9.2	11.5	...	...	9.2	11
Manchester	8.2	10.8	...	...	7.9	9.7
R. I.:						
Providence	7.3	9.6	6.9	9.2	7.1	8.9
Vermont:						
Burlington	7.8	10.1	7.5	9.8	7.5	9.2
Rutland	8	10.3	...	10	7.7	9.5

*Does not include 1% city sales tax applicable to price of gasoline (ex tax).

†In steel barrels.

Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

Atlantic Refining

Atlantic White Flash Gasoline (*Regular Grade*)

	Commercial T.W.	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Philadelphia, Pa.	10.2	10.7	5.5	11.95
Pittsburgh	10.7	11.2	5.5	12.3
Allentown	10.7	11.2	5.5	12.3
Erie	10.7	11.2	5.5	12.3
Scranton	10.7	11.2	5.5	12.3
Altoona	10.7	11.2	5.5	12.3
Emporium	10.7	11.2	5.5	12.3
Indiana	10.7	11.2	5.5	12.3
Uniontown	10.7	11.2	5.5	12.3
Harrisburg	10.7	11.2	5.5	12.3
Williamsport	10.7	11.2	5.5	12.3
Dover, Del.	....	11.2	5.5	12.3
Wilmington, Del.	....	10.7	5.5	11.8
Boston, Mass.	....	10.9	4.5	....
Springfield, Mass.	....	11.8	4.5	....
Worcester, Mass.	....	11.5	4.5	....
Fall River, Mass.	....	11	4.5	....
Hartford, Conn.	....	11.6	4.5	....
New Haven, Conn.	....	11	4.5	....
Providence, R. I.	....	11	4.5	....
Atlantic City, N. J.	....	10.7	4.5	9.7
Camden, N. J.	....	10.7	4.5	9.7
Trenton, N. J.	....	10.7	4.5	9.7
Annapolis, Md.	....	11.05	5.5	10.5
Baltimore, Md.	....	10.45	5.5	9.5
Hagerstown, Md.	....	11.55	5.5	10.0
Richmond, Va.	....	11.25	6.5	12
Wilmington, N. C.	....	11.55	7.5	11.6
Brunswick, Ga.	....	10.4	7.5	‡10.8
Jacksonville, Fla.	....	10.4	8.5	11.8

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	11	12.5
Lancaster, Pa.	12	13.5
Pittsburgh, Pa.	12.5	13.5

Fuel Oils—T.W.	1	2	3	5	6
Phila., Pa.	9.8	9	9	5.76	4.76
Allentown, Pa.	10.3	9.3	9.3	....	....
Wilmington, Del.	9.8	9	9	....	....
Springfield, Mass.	*9.9	9.4	9.4	....	....
Worcester, Mass.	*9.9	9.3	9.3	....	....
Hartford, Conn.	*9.7	9	9	....	....

‡Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent, V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Gasoline—to undivided dealers, 0.5c off dealer t.w., except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

S. O. Ohio††

***Sohio X-70 Gasoline (*Regular Grade*)**

	Consumer T.W.	**Reselers	‡S.S.	Gasoline Taxes	†Kerosine T.W.
Ohio, Statewide	12	10	13.5	5.5	9.3
Akron	12	9.5	12.5	5.5	9
Cincinnati	12	9.5	12.5	5.5	9
Cleveland	12	9.5	12.5	5.5	9
Columbus	12	9.5	12.5	5.5	9
Dayton	12	9.5	12.5	5.5	9
Marietta	12	9.5	12.5	5.5	9
Portsmouth	12	9.5	12.5	5.5	9
Toledo	12	9.5	12.5	5.5	9
Youngstown	12	9.5	12.5	5.5	9

Aviation Gasoline—Statewide

	Consumer T.W.	Gasoline Taxes
Sohio aviation grade 65 octane, Spec. AN-VV-F-756	14.5	5.5
Esso Ethyl Aviation 73 Oct.	15.5	5.5
Esso Ethyl Aviation 80 Oct.	16.5	5.5
Esso Ethyl Aviation 87 Oct.(a)	17.5	5.5
Esso Ethyl Aviation 91 Oct.	17.5	5.5
Esso Ethyl Aviation 100 Oct.	24.5	5.5

(a) Effective Oct. 15, 1942.

	†Naphtha—T.W. Statewide	Lucas County
S. R. Solvent	13.5	13.5
D. C. Naphtha	14.5	14.25
V.M.&P. Naphtha	14.5	14.25
Varnolene	14.5	14.25
Sohio Solvent	14.5	14.25

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	8.3	8.3	7.8	....
Cleveland	10.3	10.3	9.8	7.55

*Renown (third-grade) prices are same as X-70 unless otherwise noted.

**Except authorized agents.

†Kerosine prices are ex 1c state tax. Naphtha prices are ex 1.5c federal & 4c state tax.

‡Prices at company-operated stations.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers, 2c off consumer t.w.

Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher. Cleveland Nos. 1, 2, and 3 prices are for bulk deliveries of 5 to 99 gals.; 100 gals. and over are 2c less. Cleveland No. 4 price is for full compartment hose dump only.

Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c. Lucas County: Less than 50 gals., tank wagon price; 50 to 249 gals., 0.5c; 250 to 499 gals., 1c, 500 gals. or over, 1.5c.

S. O. Kentucky

Crown Gasoline (*Regular*)
Standard (*Third Grade*)

	†Net Crown	Dealer Standard	Gasoline Taxes	Kerosine T.W.
Covington, Ky.	9.5	8.5	6.5	9.25
Lexington, Ky.	10.5	8.5	6.5	9.25
Louisville, Ky.	10	9	6.5	8.75
Paducah, Ky.	10	8	6.5	8.75
Jackson, Miss.	10	9	7.5	*9
Vicksburg, Miss.	9.5	8.5	7.5	*8.5
Birmingham, Ala.	10	9	*8.5	9
Mobile, Ala.	9	7	*9.5	8.5
Montgomery, Ala.	10	9	*9.5	10
Atlanta, Ga.	11.4	...	7.5	*11.8
Augusta, Ga.	11.4	...	7.5	*11.3
Macon, Ga.	11.4	...	7.5	11.8
Savannah, Ga.	10.4	...	7.5	*10.8
Jacksonville, Fla.	10.4	...	8.5	9.8
Miami, Fla.	10.4	...	8.5	9.8
Pensacola, Fla.	9	8	*9.5	8
Tampa, Fla.	10.4	...	8.5	9.8

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city; Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, not included in above prices.

†Consumer t.w. prices are same as net dealer prices.

S. O. Indiana

Red Crown (*Regular Grade*)
Blue Crown (*Third Grade*)
Dealer Prices

	Red Crown Cons. T.W.	Red Crown	Blue Crown	Gasoline Taxes	Kerosine T.W.
Chicago, Ill.	10.9	8.9	8.4	4.5	10.6
Decatur, Ill.	10.9	8.9	8	4.5	9.8
Joliet, Ill.	11.9	9.6	8.5	4.5	10.6

(Continued on next page)

Above prices include these inspection fees on both gasoline and kerosine unless otherwise specified per gallon: Alabama 1/40c on gasoline, 1/2c on kerosine; Arkansas 1/20c; Florida 1/8c; Illinois 3/100c; Indiana 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 24 bbls.; Kansas 1/50c; Louisiana 1/32c; Minnesota 7/200c; Missouri 1/50c; Nebraska 3/100c; Nevada, gasoline 1/20c; North Carolina 1/4c; North Dakota 1/20c; Oklahoma 2/25c; South Carolina 1/8c; South Dakota 1/20c; Tennessee 2/5c; and Wisconsin 3/100c.

Kerosine inspection fees only: Iowa 3/50c; Michigan 1/5c per gal.

TANK WAGON PRICES

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown n general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnoles. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect March 1, 1943 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

S. O. Indiana (Cont'd)

Red Crown (*Regular Grade*)
Blue Crown (*Third Grade*)

	Dealer Prices				
	Red Crown Cons. T.W.	Red Crown	Blue Crown	Gasoline Taxes	Kerosine T.W.
Peoria, Ill.	11.7	9.2	9.1	4.5	10.4
Indianapolis, Ind.	11.6	9.7	9.6	5.5	*10.1
Evansville, Ind.	11.4	9.9	7.9	5.5	*9.9
South Bend, Ind.	12	10.5	10	5.5	*10.5
Detroit, Mich.	11.4	9.9	9.4	4.5	10
Grand Rapids, Mich.	10.8	9.3	8.8	4.5	9.9
Saginaw, Mich.	11.4	9.9	9.4	4.5	9.9
Green Bay, Wis.	12.2	10.7	10.2	5.5	10.9
Milwaukee, Wis.	12.1	10.6	10.1	5.5	10.8
La Crosse, Wis.	11.9	10.4	9.9	5.5	10.6
Minneapolis-St. Paul	11.9	10.4	9.5	5.5	10.6
Duluth, Minn.	12.2	10.7	10.2	5.5	10.9
Mankato, Minn.	11.9	10.4	9.5	5.5	10.6
Des Moines, Ia.	11.4	9.9	9.4	4.5	*10.1
Mason City, Ia.	11.7	10.2	9.7	4.5	*10.4
St. Louis, Mo.	10.3	8.8	8.6	*4.5	10.1
Kansas City, Mo.	10.4	8.9	7.9	*4.5	9.7
St. Joseph, Mo.	11.2	9.7	8.7	*4.5	9.7
Fargo, N. D.	12.9	11.4	10.5	5.5	11.6
Huron, S. D.	12.3	10.8	10.3	5.5	11
Wichita, Kans.	9.7	8.2	6.5	4.5	8.3

Stanavo Aviation 73 Octane

Chicago, Ill.	15.7	4.5
Milwaukee, Wis.	15.9	5.5
Minneapolis, Minn.	15.7	5.5
St. Louis, Mo.	15.2	*4.5
Kansas City, Mo.	14.8	*4.5
Fargo, N. D.	16.7	5.5
Huron, S. D.	16.1	5.5

	Oleum Spirits	V.M.&P. Naphtha	Stanisol	*Taxes
	(Prices are base prices before discounts)			
Chicago	13.5	13.8	12.8	4.5
Detroit	15.8	15	16.3	4.5
K. C., Mo.	13.3	14.3	13.8	1.5
St. Louis, Mo.	13.7	14.7	13.2	1.5
Milwaukee	14.4	15.4	14.9	5.5
Minneap'lis	14.2	15.2	13.5	5.5

Fuel Oils T.W.
Chicago

	Standard Heater Oil
1-99 gals.	9.3
100-149 gals.	8.3
150 gals. & over	7.8

	Stanolex Fuel Oil No. 1	Stanolex Furnace Oil
1-99 gals.	8.8	8.8
100-149 gals.	7.8	7.8
150-399 gals.	7.8	7.8
400 gals. & over	7.3	7.3

	Stanolex Fuel Oil A	Stanolex Fuel Oil B
1-99 gals.	8.3	8.3
100-399 gals.	7.3	7.3
400-749 gals.	6.3	6.3
750 gals. & over	5.55	5.55

Stanolex Bunker C Fuel Oil

1-399 gals.	6.8
400-999 gals.	5.8
1000 gals. & over	4.8

Other Points Indianapolis	Stanolex No. 1	Stanolex Furnace Oil
1-99 gals.	....	*9.0
100 gals. & over	....	*8.0
Detroit		
1-99 gals.	....	8.1
100 gals. & over	....	7.1
Milwaukee		
1-99 gals.	....	9.0
100 gals. & over	....	8.0
Minneapolis		
1-99 gals.	....	8.8
100 gals. & over	....	7.8
St. Louis		
1-99 gals.	8.6	8.1
100 gals. & over	7.6	7.1
Kansas City		
1-99 gals.	....	7.9
100 gals. & over	....	6.9

***Taxes:** In gasoline tax column are included these city taxes—Kansas City, St. Joseph, and St. Louis, 1c. Indiana kerosine and fuel oil prices are ex 4c state tax; Iowa kerosine prices are ex 3c state tax. In naphtha tax column are included 1.5c federal tax and state taxes.*

S. O. Nebraska

(*Regular Grade*)

	T.W. Dealer	Gasoline Taxes	Kerosine T.W.
Omaha	11.4	8.9	6.5	10.1
McCook	10.5	9.4	6.5	9.3
Norfolk	11.9	10.4	6.5	10.6
North Platte	11	9.9	6.5	10.3
Scottsbluff	12.4	9.5	6.5	9.8

S. O. Louisiana

Esso Gasoline (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
New Orleans, La.	8.75	9.25	8.5	*9
Baton Rouge, La.	8.75	9.25	8.5	*9.5
Alexandria, La.	8.75	9.25	8.5	*9.5
Lafayette, La.	9	9.5	8.5	*9
Lake Charles, La.	9	9.5	8.5	*11
Shreveport, La.	8.5	9	8.5	*8
Knoxville, Tenn.	9.5	10	8.5	12.5
Memphis, Tenn.	8.90	9.40	8.5	10.5
Chattanooga, Tenn.	10.5	11	8.5	11
Nashville, Tenn.	10.5	11	8.5	10
Bristol, Tenn.	10.95	11.45	8.5	13.1
Little Rock, Ark.	9.5	10	8	10

*Louisiana kerosine prices are ex 1c state tax.
Discounts:
Esso Gasoline—To undivided dealers, 0.5c off dealer t.w.

Humble Oil & Refining Co.

Humble Motor Fuel (*Regular Grade*)
Thriftane (*Third Grade*)

	Humble *Tank Wagon	Humble Retail	Thriftane *Tank Wagon	Thriftane Retail	Gasoline Taxes
Dallas, Tex.	6.5	9.5	5.5	7.5	5.5
Ft. Worth, Tex.	6.5	10.5	6	9	5.5
Houston, Tex.	8.5	12.5	7.5	10.5	5.5
San Antonio, Tex.	8.5	12.5	7.5	10.5	5.5

	Kerosine *Tank Wagon	Kerosine Retail
Dallas, Tex.	7	11
Ft. Worth, Tex.	7	11
Houston, Tex.	8	11
San Antonio, Tex.		10

	73 Oct. Aviation Gasoline	Tank Car
FOB Baytown, Tex.		8.5

*To all classes of dealers & consumers.

The Texas Co.

	Gasoline—Dealer T.W. Fire-Chief (*Regular*)	Indian (*3rd Grade*)	Gasoline Taxes
Dallas, Tex.	6.5	5.5	5.5
Ft. Worth, Tex.	6.5	6.0	5.5
Wichita Falls, Tex.	8.5	7.5	5.5
Amarillo, Tex.	8.5	7.5	5.5
Tyler, Tex.	8.5*	7.5*	5.5
El Paso, Tex.	9.5	8.5	5.5
San Angelo, Tex.	8.5	7.5	5.5
Waco, Tex.	8*	7*	5.5
Austin, Tex.	8.5	7.5	5.5
Houston, Tex.	8.5	7.5	5.5
San Antonio, Tex.	8.5	7.5	5.5
Port Arthur, Tex.	8.5	7.5	5.5

*Less 1c temporary allowance to all dealers.

Continental Oil Co.

(N.B. Prices are Continental's "structural" prices. Prices do not reflect temporary reductions made to meet local competition).

	Conoco Bronz-z-z (*Regular*) †Tank Wagon	Demand (*3rd Grade*)	Gasoline Taxes	Kerosine T.W.
Denver, Col.	11	10	5.5	11
Grand Junction, Col.	12	11	5.5	12
Pueblo, Col.	10.5	9.5	5.5	10.5
Casper, Wyo.	11.5	10.5	5.5	12
Cheyenne, Wyo.	11	10	5.5	11.5
Billings, Mont.	12.5	11.5	6.5	12.5
Butte, Mont.	13.5	12.5	6.5	13.5
Great Falls, Mont.	12.5	11.5	6.5	12.5
Helena, Mont.	13	12	6.5	13
Salt Lake City, Utah	13.5	12.5	5.5	14.5
Boise, Ida.	14.1	13.1	6.5	16.5
Twin Falls, Ida.	15.6	14.6	6.5	17
Albuquerque, N. M.	10	9	*7	9.5
Roswell, N. M.	9.5	8.5	*7	9
Santa Fe, N. M.	10.5	9.5	*7.5	10
Ft. Smith, Ark.	9.5	9.25	*7	9.5
Texarkana, Ark.	9	8	*5.5	9
Muskogee, Okla.	9.5	8.5	7	8.5
Oklahoma City, Okla.	9.5	8.5	7	8.5
Tulsa, Okla.	9.5	8.5	7	8.5

*Taxes: In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c; Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana, Ark.; Okla. 5.5c state applies within city limits of Ft. Smith, Ark.
†To consumers & dealers.

S. O. California

Standard Gasoline (*Regular Grade*)
Flight Gasoline (*Third Grade*)

	Standard Posted Net Tank Truck	Standard Posted Retail	Flight Posted Net Tank Truck	Flight Posted Retail	Gasoline Taxes
San Francisco, Cal.	10	14	9	12	4.5
Los Angeles, Cal.	9.5	13.5	8.5	11.5	4.5
Fresno, Cal.	11	15	10	13	4.5
Phoenix, Ariz.	12	16	10	13	6.5
Reno, Nev.	12	16	11	14	5.5
Portland, Ore.	10.5	14.5	9.5	12.5	6.5
Seattle, Wash.	10.5	14.5	9.5	12.5	6.5
Spokane, Wash.	10.5	14.5	9.5	12.5	6.5
Tacoma, Wash.	10.5	14.5	9.5	12.5	6.5

	Std. Aviation 73 Posted Net Tank Truck	Gasoline Taxes	Kerosine Tank Truck
San Francisco, Cal.	12.5	4.5	11.5
Los Angeles, Cal.	12	4.5	10
Fresno, Cal.	13.5	4.5	12.5
Phoenix, Ariz.	14.5	6.5	12.5
Reno, Nev.	14.5	5.5	13.5
Portland, Ore.	13	6.5	13.5
Seattle, Wash.	13	6.5	13.5
Spokane, Wash.	16	6.5	16.5
Tacoma, Wash.	13	6.5	13.5

Resale & Commercial: T.C. deliveries 0.25c per gal. off posted net tank truck.
Commercial: Retail deliveries, and/or tank truck deliveries of less than 40 gals., 4c per gal. above posted net tank truck price for Standard Aviation and Standard Gasoline, and 3c per gal. above posted net tank truck for Flight Gasoline, except single deliveries of less than 40 gals. to Marine trade only, which are billed at posted net tank truck price.

Canada

PRICES ON IMPERIAL OIL, LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

3-Star Imperial Gasoline (*Regular Grade*)

	†Gasoline T.W.	*Gasoline Taxes	†Kerosine T.W.
Hamilton, Ont.	17.5	11	18
Toronto, Ont.	17.5	11	18
Brandon, Man.	21	10	23
Winnipeg, Man.	20.5	10	22.5
Regina, Sask.	18	10	20
Saskatoon, Sask.	20.8	10	22.8
Edmonton, Alta.	18.9	10	20.9
Calgary, Alta.	16	10	18
Vancouver, B. C.	15	10	24
Montreal, Que.	17	11	17.5
St. John, N. B.	16.5	13	19
Halifax, N. S.	16.5	13	19

*Includes 3c Federal, and Provincial taxes.
†To divided & undivided dealers.

Above prices include these inspection fees on both gasoline and kerosine unless otherwise specified per gallon:
Alabama 1/40c on gasoline, 1/2c on kerosine; Arkansas 1/20c; Florida 1/8c; Illinois 3/100c; Indiana 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 25 bbls.; Kansas 1/50c; Louisiana 1/32c; Minnesota 7/200c; Missouri 1/50c; Nebraska 3/100c; Nevada, gasoline 1/20c; North Carolina 1/4c; North Dakota 1/20c; Oklahoma 2/25c; South Carolina 1/8c; South Dakota 1/20c; Tennessee 2/5c; and Wisconsin 3/100c.
Kerosine inspection fees only: Iowa 3/50c; Michigan 1/5c per gal.

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IF YOU CAN'T FIND A USE FOR IT, *Scrap it!*

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FOR SALE—Bolted tanks 5000 and 10,000 barrel capacity API construction practically new. Feldman Petroleum Company, 544 W. Roosevelt Rd., Chicago, Ill.

FOR SALE—1 N-F 1936 Autocar tractor just rebuilt and 3570 gallon trailer of 5 compartments in A-1 shape. Ready to work. Price $6000.00. A. V. Rivest Oil Company, Springfield, Mass.

FOR SALE

2- 20000 gal. vertical tanks
2- 15300 gal. vertical tanks
2 6500 gal. horizontal tanks
2 Pumping units complete
1 1936 Ford truck & tank good tires
1 1933 Dodge truck & tank good tires

P. O. Box 849, Muncie, Ind.

FOR SALE

One Twin Viking pump unit, Exc. Cond. Model OLE1, 2" Suc. & Dis. 3 H.P. 3 Phase, 220 V. Motor. Good relief valve and clutches. $225.00. One Viking Single Unit, Model ZL, 2" Suc. & Dis. 3 H.P. Single Phase, 110-220 V motor. Exc. Cond. $165.00. Two McDonald hand pumps, 6" Suct. & stroke, $25.00 ea. 550 Gal. U. G. tanks, 2" gates. Other fittings.

Bowen Oil & Equipment Co.,
Bement, Illinois

FOR SALE

1940 Model Columbian semi-trailer, 4 compartments, 3600 gallons. Ford tractor, 2 speed axle, 1940 model in good condition. All tires on trailer new. Tires on tractor in good condition. This job has other extras. Price $4550.00.

Wisconsin Independent Oil Company
5309 West State Street
Milwaukee, Wisconsin

FOR SALE—2650 gallon, 4 compartment Columbian semi-trailer, 3 enclosed package & barrel carriers.

2400 gallon, 4 compartment Columbian semi-trailer, 2 barrel carriers.

2200 gallon, 5 compartment Fruehauf semi-trailer, 3 enclosed package & barrel carriers.

Each of the above equipped with B-K vacuum brakes & 825 x 20 tires.

Imperial Oil Co.,
6th & Patee
St. Joseph, Missouri.

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EXPERIENCED IN SALES and manufacture industrial petroleum products. Unusual national record. Desires position salesman, salesmanager or as assistant to important executive. Able to develop products or territory. Draft exempt. Box No. 5, Room 1418, 59 E. Van Buren, Chicago, Ill.

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Graduate Chemical Engineers and Chemists. Prefer men with experience in refinery or gasoline plant on design or operation of light end equipment. Location—Mid-West. Permanent position. In reply state experience, education, age, draft status and salary expected.

Address Box No. 209
National Petroleum News

Wanted to Buy

WANTED TO BUY—3000 to 4200 gallon transport. Give full description, picture if possible. Kendall Oil Company, Knoxville, Tenn.

NAILING MACHINES WANTED—we want Morgan or Doig wood box nailing machines at once. State make, size, best cash price. Chas. N. Braun Machinery Co., Fort Wayne, Indiana.

WANTED TO BUY: A good used four thousand gallon semi-trailer preferably with two or more compartments, with or without tractor, prefer with late model tractor. Give full details in first letter. Address all communications to Espy Service Station, Eufaula, Alabama.

WANTED TO BUY—One 4,000 gallon 3 compartment Semi-Trailer and Tractor. Please show brake and tire specifications, make of tank and tractor, together with picture of unit and best price. Box No. 210.

WANTED: Service truck wrecker, late model; will pay cash for a good job; advise condition, give actual mileage, equipment, and price. Send picture, if possible.

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Ypsilanti, Michigan

WANTED

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Los Angeles, 610-A Hillstreet Bldg., Telephone, VAndike 2845.

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PERSONALS

Paul M. McConihe

Paul M. McConihe, manager of lubrication sales for Seaside Oil Co., Santa Barbara, Calif., and a well known petroleum engineer, has joined the Marines as a Captain. He is now at San Francisco, awaiting permanent assignment. Capt. McConihe is a member of the A. C. S. and the S. A. E.

Another Seaside executive to enter service is **Greydon C. Howell,** secretary and director, who joined the American Red Cross. **George D. McPhee,** assistant secretary, succeeds Mr. Howell, and **Earl C. Beaulieu** becomes assistant secretary.

° * °

William Henry Armstrong, former assistant branch manager for the Newark, N. J. district of the Atlantic Refining Co., has enlisted as a volunteer candidate for officer training, and is on duty with Company A, 31st Training Battalion, Camp Croft, Spartanburg, S. C.

° * °

Glenn Bish, formerly superintendent of production of the Mt. Pleasant Mich. division of The Ohio Oil Co., Findlay, Ohio, has been promoted to manager of that division. Mr. Bish joined the company in the Louisiana field, and worked also in the Hobbs, N. M., and Houston districts.

° ° °

Miller W. Conn, Bartlesville, manager of the Peco section, Phillips Petroleum Co.'s special products department, has joined the U. S. Navy as a Lieutenant, s. g. **A. E. Buell** succeeds him as acting manager.

° ° °

Some 300 Tulsa businessmen thronged the Chamber of Commerce dining room Feb. 12 to hear **Phil Bohart,** assistant to the executive vice-president of Gulf Oil Corp. and first vice-president of the Chamber, address the weekly public affairs luncheon gathering on "What the Oil Industry Means to Tulsa".

Presented to the group as "representative Tulsa oil men" were **W. G. Skelly,** president, Skelly Oil Co. and of the International Petroleum Exposition; **W. L. Connelly,** chairman of the board, Sinclair Prairie Oil Co.; and **Ralph B. Roark,** Shell Oil Co., vice-president for the Mid-Continent area and chairman of the Chamber's oil activities committee.

Barton P. Sibole, president, Stanolind Pipe Line Co., **presided.**

Socony-Vacuum Oil Co. has appointed **Henry J. Muller** as general sales manager of the White Star-Ohio Division, Detroit. He succeeds the late **Charles S. Smith.**

Mr. Muller first worked in the Bayonne, N. J., Lubricating oil plant of the Vacuum Oil Co. in 1912. In 1918, he was transferred to the company's headquarters in New York and in the same year joined the Army in the first World War. After the armistice, he returned to the company, later becoming assistant secretary. After the merger of Standard and Vacuum in 1932 he was, for a time, assistant secretary of Socony-Vacuum. For several years he has been assisting C. E. Arnott, vice-president, directing Mid-West operations, with offices in New York.

Thomas E. Richards, who has been operations representative in the lubricating department, of central marketing division, succeeds Mr. Muller as assistant to Mr. Arnott. **R. B. Ogden** becomes manager of the formulae, price and brand department, which also was one of Mr. Muller's responsibilities.

° ° °

Walter E. Krueger

Walter E. Krueger, Milwaukee, a World War I veteran and for the past 14 years with Wadhams Division, Socony-Vacuum, is now a Lieutenant, s.g., U. S. Navy. He was manager of the company's retail service stations in Milwaukee county. Mr. Krueger was born at Watertown, Wis., graduated from Marquette University in 1923, and was a member of the American Legion, City Club, and Westmoor Country Club.

° ° °

An oil man who is active in the development of one of the most worthwhile projects of the day—a center for the blind and particularly for the newly war-blind—is **R. H. Cook,** manager of the domestic fuel oil sales for Tide Water Associated Oil Co., San Francisco. As president of the city's Lions' Club, which undertook this project last fall, he is devoting much of his time and effort to the project.

The center, known as the San Francisco Center for the Blind, is designed as an educational and recreational haven. Its prime purpose is to help the war blind make the difficult adjustments that follow loss of sight.

° ° °

Harold Medill, formerly attorney for the Kansas Corporation Commission, is now with the pipeline division of Sinclair Refining Co. at Independence, Kans.

C. George Krieger

C. George Krieger, head of Ethyl Corp.'s agricultural division, was promoted Feb. 2 from deputy director to acting director of WPB's farm machinery and equipment division, Washington.

Mr. Krieger is one of the pioneers in high compression tractor engine development. He joined Ethyl Corp. as an agricultural engineer and in 1932 was made director of tractor activities, technical sales department. In 1942 he moved up to the post he now holds. He is on leave of absence from Ethyl.

Mr. Krieger is vice-president of the S.A.E., chairman of that society's farm machinery conservation committee, chairman of the fuels and lubricants committee, American Society of Agricultural Engineers, and a honorary life member, American Agricultural Editors Assn.

° ° °

The Silver Star and Purple Heart award was given recently to **Capt. Wilson Chapman,** Midland, Tex., formerly geologist for Shasta Oil Co., for action in Pacific war. He was wounded, and is now back in Midland.

° ° °

W. T. Zeigenhein, formerly an editor with Oil & Gas Journal, Tulsa, has joined Phillips Petroleum Co. as assistant manager, Perco section, technical products division of the special products department, Bartlesville.

° ° °

W. J. Gerwe, Chicago, manager of the automotive division of Socony-Vacuum, completed his 25th year with that company Feb. 17. He started with the Vacuum Oil Co. at Chicago in 1918, was sales manager at Des Moines and Milwaukee, then back to Chicago in the present capacity.

° ° °

W. K. Holmes, superintendent of Texaco's Tulsa refinery, has returned, feeling fit, from a mid-winter vacation at Hot Springs, Ark.

° ° °

A 30-year service pin was presented recently to **R. M. Stephens,** head of the aviation, publicity and specialty products departments, and direct sales for Humble Oil & Refining Co., Houston. Mr. Stephens came to the Humble in 1912 with the Bonner Oil Co., which was acquired by Humble in 1919. **Hines H. Baker,** vice-president, made the presentation.

There have been

77

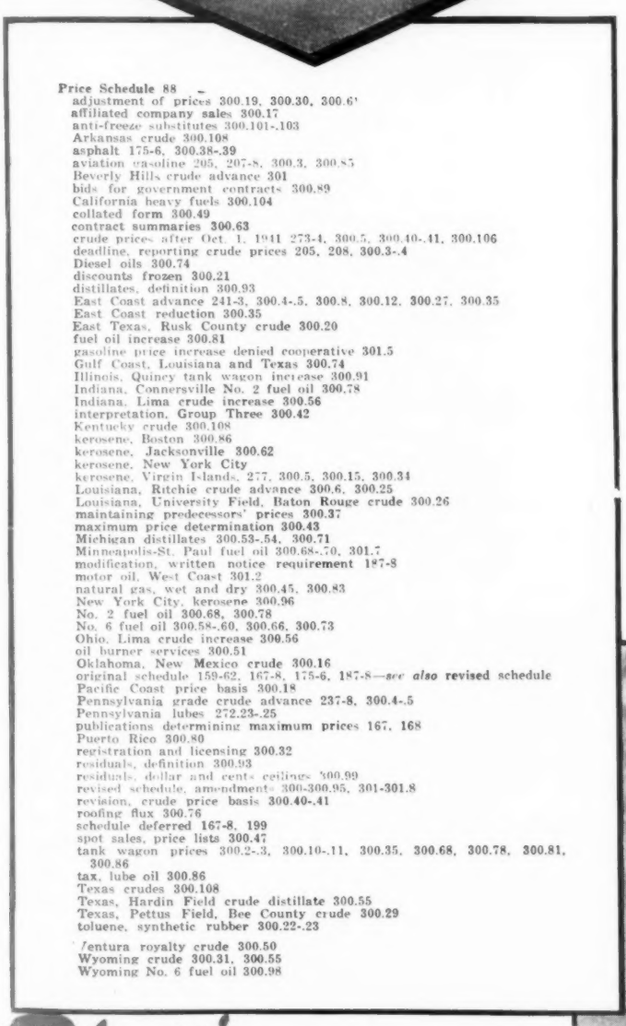
AMENDMENTS

to this one

PRICE ORDER

and they're still coming

FAST!



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NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to
REFINERY MANAGEMENT and PETROLEUM CHEMICAL TECHNOLOGY

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Volume 35 | March 3, 1943 | Number 9

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Sprayed metals are applied to vessels as protection from corrosion; also found practical means to build up worn surfaces of pump rods and plungers R-102

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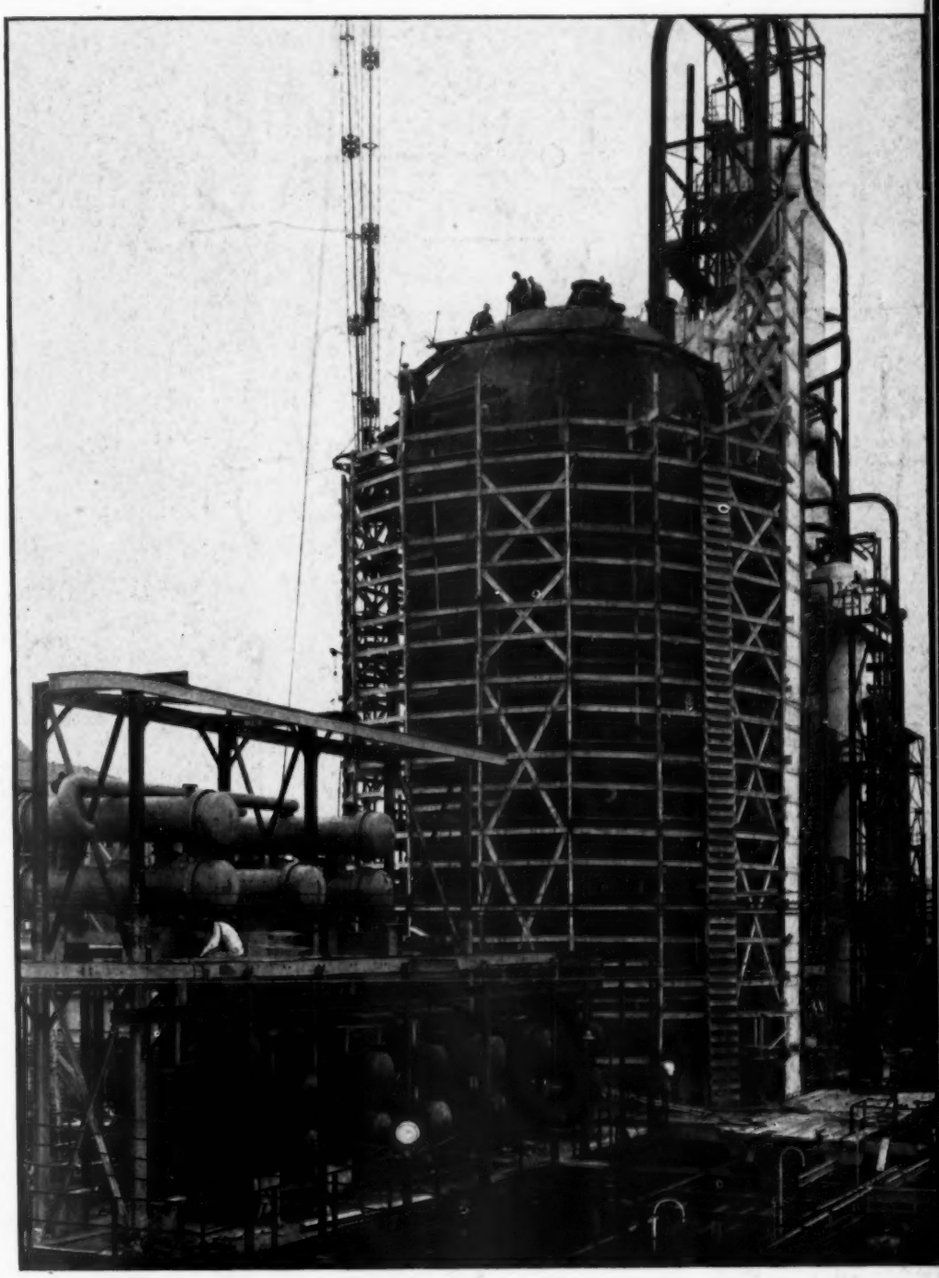


33-Foot Diameter Tower Completed

Interest by readers in the 33-foot diameter vacuum fractionating tower described in the last previous issue in the construction stage, led to requests to show what the completed tower looked like. Above is the tower when completed but before removal of scaffolding. New methods of design and construction by arc welding were used in the erection of this tower, as far as known the largest ever built. (See NPN Technical Section, Feb. 3, 1943, p. R-74). The structure shown in the rear is an 18-foot and 16-foot diameter atmospheric fractionating tower approximately 140 feet high, supplied for the original crude still. The battery of heat exchangers in front serve as both heaters and coolers for the combined atmospheric and vacuum units.

Charles Albert Warner

1943 Chairman, Petroleum Division, A.I.M.E.

Charles Albert Warner, Houston, petroleum engineer and geologist, superintendent of the land department of the Houston Oil Co., is the new chairman of the Petroleum Division of the American Institute of Mining and Metallurgical Engineers, elected at its meeting in February in New York. He has been active in the petroleum field of the institute since 1919 and sponsored and organized a Student Loan Fund in the Gulf Coast section of the A.I.M.E.

Graduating from Cornell in 1917, where he majored in geology, he worked as oil company field geologist in the Mid-Continent until 1921 when he became Mid-Continent district manager for the Houston Oil Co. He was transferred to Houston in 1932 and two years later became superintendent of the land department. He was made a company director in 1941.

REFINERY MANAGEMENT *and*
PETROLEUM CHEMICAL TECHNOLOGY

March 3, 1943
Volume 35
Number 9

A MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

Refining Resources Pooled to Produce Essential Wartime Products*

721.3
751.4

By Walter Miller**

The same high degree of wartime cooperation that refining companies have already shown in the aviation gasoline and synthetic rubber programs has been extended to supplying the large volume of toluene needed for T.N.T. manufacture. Pending completion of their own toluene extracting facilities, other large oil companies have been shipping distilled concentrates containing 25 to 40% of toluene to the Baytown Ordnance Works of the Humble Oil & Refining Co., which had the capacity to refine more toluene than it produced in its hydroformer operation. As a result, several million gallons of this product for T.N.T. were supplied which otherwise would not have been available.

This and other accomplishments of the refining industry after one year of war, and the new demands for new products now being made on the industry, are discussed in the accompanying annual report of the chairman of the refinery engineering committee of the Petroleum Division, American Institute of Mining and Metallurgical Engineers.

NOW, after a year's continued impact of war, the task of the petroleum refining industry stands out clearly and looms up in larger aspect. This time it is not, as was so largely in the first World War, simply a matter of increased quantity—more and more of the same petroleum products that had substantially been standard for years. In this era the emphasis is largely on newer and improved materials which had been produced, if at all, in comparatively insignificant quantities, and for which manufacturing equipment was not available on a large scale.

At the beginning of 1942 four great product needs (besides a number of lesser ones) confronted the industry: 100-octane aviation gasoline, toluene for T.N.T. production, high-quality lubricating oils for aviation and Army equipment service, and petroleum chemicals for synthetic rubber manufacture.

The difficulty in presenting a review of engineering progress in petroleum refining during 1942 is that there is so little one is free to say about so much which has been and is being accomplished.

At the first of 1942 the program was to increase the then existing capacity of 50,000 bbls. a day of aviation gasoline to over 150,000 bbls. daily by building new plants at an estimated installation cost of $150,000,000. Later in the year, after the announcement by President Roosevelt of a large increase in the program for war-plane building, additional contracts were made between the Reconstruction Finance Corp. and refiners to raise the capacity to 250,000 bbls. per day.

The greatly increased scope of the war activities in all parts of the world, the obligation of the U. S. as the arsenal of the United Nations, and the greater importance and use of bomber, transport, and cargo planes will undoubtedly bring about plans and installations for a further increase in production of aviation gasoline over the present announced plan.

In this connection, Jesse Jones, RFC chairman, announced that as of Oct. 31 the RFC had through its subsidiary Defense Plant Corp. entered into contracts for the construction, expansion, or equipping of 28 plants to increase 100-octane aviation gasoline production, but gave no data on capacity involved or completion dates. His list did not include a number of existing plants, and some installations being made by companies who are themselves financing the construction.

Production from existing operating installations was materially increased in a number of instances as a result of pooling knowledge of improvements in operation and also by the exchange of components going into 100-octane blend to enable greater quantities of aviation gasoline to be produced from the overall component materials available. Progress has also been made in "know-how" and practice for improved quality in the form of rich-mixture characteristics for better performance in starting and emergency full-throttle power output and in flying under super-charging conditions.

Some new installations of toluene producing plants with comparatively small capacities came into operation during 1942. Several contracts were entered into for hydroformer and solvent extraction units, the latter for re-

One of the first commercial units for production of nitration grade toluene for T.N.T. from petroleum. The picture was taken during construction of the plant, which is located on the Gulf Coast

*A report presented to the Petroleum Division, American Institute of Mining and Metallurgical Engineers, in connection with the annual 1943 meeting of the A.I.M.E., New York, Feb. 15-18.

**Vice-president, Continental Oil Co., Ponca City, Okla., chairman committee on Refinery Engineering, Petroleum Division, American Institute of Mining and Metallurgical Engineers; Member Technical Advisory Committee of Petroleum Industry War Council.

fining the toluene produced by such hydroforming operations. These new installations are to be completely ready for operation during 1943.

Current production of toluene during the year was considerably augmented by the ability of the Baytown Ordnance Works to refine more toluene than was produced in its hydroformer operation. As a result of this fortunate condition the Continental Oil Co., Pan American Refining Corp., Sinclair Refining Co., and Shell Oil Co., pending the completion and operation some time in 1943 of their toluene extraction and refining facilities, were able to ship to the Baytown plant distilled concentrates containing from 25 to 40% toluene, which the ordnance works finished up and made available immediately for nitration to T.N.T. Several million extra gallons were "prematurely" made available by following this procedure, a worth-while contribution, as it made possible the additional production of more than 14,000,000 lbs. of T.N.T. for every million gallons of toluene so made available.

During the year a series of technical meetings was held under the auspices of the Ordnance Department, working with the Petroleum Administration for War. These meetings were attended by all immediately interested process and plant designing and construction companies, by catalyst developing and manufacturing companies, and all refining companies making toluene or about to make toluene. All experience and know-how pertaining to processes, design, and operation of both hydroformer and toluene extraction and refining units, including catalyst manufacture, composition and use, were freely discussed and exchanged.

Walter Miller

Chemicals, analytical knowledge, and experience, important both as to charge stocks and intermediate and finished products, were also brought out in these discussions, so as to bring about the universal adoption of accepted best methods of examination and analyses. These meetings, one illustration of the working out of a general program in the industry for cooperative research and development in petroleum refining in connection with production of essential war products, have been productive in many ways, and the current toluene output with the facilities at hand has been considerably enhanced.

The good results of better feed-stock selection and preparation, better catalysts and use technique, improved operations of hydroformers and toluene refining facilities are all apparent and are of course available also for new installations as they come "on the line."

Though detailed figures on production are not available, the program is proceeding somewhat better than expected. The rate of use of T.N.T., however, also seems to be going beyond previous estimates, and every effort will be needed to meet requirements.

No further installations for solvent treating plants to increase high-grade lubricating oil production were announced as having been authorized during the year. The new plants authorized in 1941 and mentioned in my review for that year must be close to completion if not already in operation.

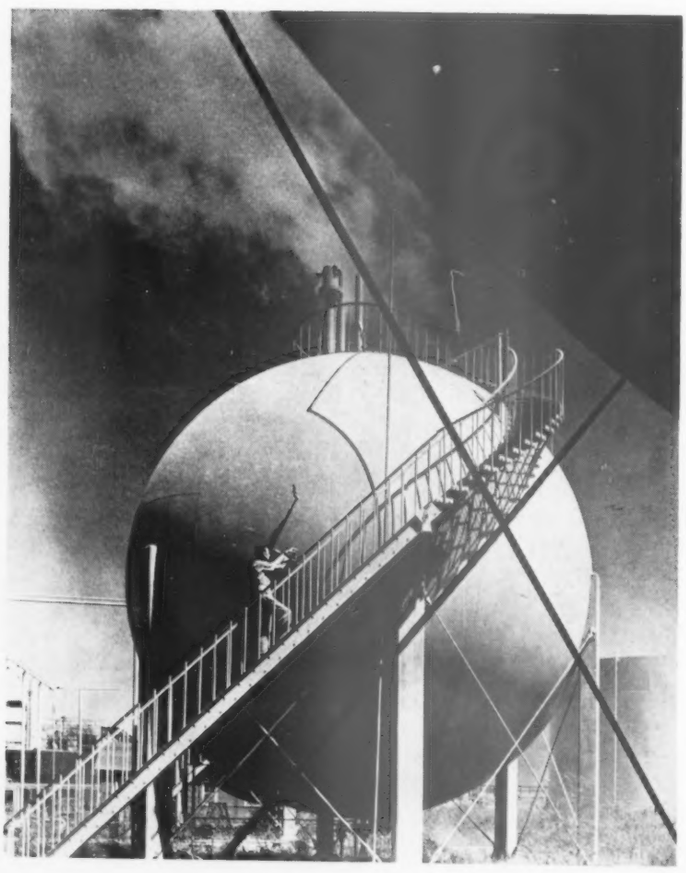
The requirements during the year were met without difficulty by existing installations, but the output of the new plants will be needed to help take care of the widely extended requirements as our activities and those of our allies in this global war approach their zenith. It is understood that the situation is being closely studied from the viewpoint of anticipating possible additional capacity requirements.

(*The portion of Mr. Miller's report dealing with the synthetic rubber program is omitted here, since it has recently been reviewed at length in other reports*—Editor)

The refining industry continued rapidly to expand its research and development activities in the newer fields of plastics and chemical manufacture, as well as war products. A start has been made in giving effective aid to Russia in the fact that the refinery recently built by the Douglas Oil and Refining Co. on the Pacific Seaboard is to be transported bodily to Russia. This is reported to be the first step in a program involving some $15,000,000 to $20,000,000.

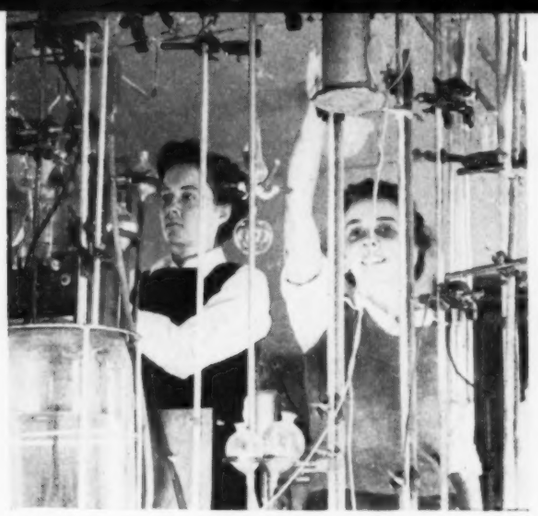
The industry has given the services of many of its outstanding executives and technical men to assist PAW and other governmental agencies in various phases of the prosecution of the war. It is making adjustments by lengthening working hours and training women for suitable jobs to offset the loss of manpower to the armed forces and to care for its own plant expansion.

During the past year the industry met substantially all the demands that were made upon it for the prosecution of the war. It has expanded and is expanding to handle satisfactorily the much larger calls that will be made upon it during the coming year.



The girl learning to be a carpenter's helper was a store clerk for 6 years. Her husband is in the Army Air Corps

Another carpenter's helper who is an ex-telephone operator with two brothers in military service



Doing routine testing of plant samples in the laboratory. Before the war men did this work

They Fill Plant and Warehouse Jobs of Men Gone to War

The photographs and accompanying article illustrate the wide variety of refinery shop and warehouse jobs of one oil company where women are now replacing men. Because its experience in this field is new, this company asked that its name be withheld.

Women replacing men are not limited to secretarial, clerical and messenger jobs. They are being hired as instrument repairers, laboratory workers, gaugers, checkers and loaders, warehouse helpers or carpenter's helpers.

Some jobs, requiring labor too heavy for the ordinary woman to perform, have been broken down so that women can do the light part, while men handle the heavy. In other cases, levers, hand trucks, dollies, and portable hoists have been provided to eliminate the necessity for a strong male back or arm.

Company officials report that women are adapting themselves even to this heavy work. Many men, scorning a hand truck or dolly to move heavy articles, will "strong-arm" one or two at a time, while a woman, knowing she cannot wrestle even one, loads 6 or 7 on a hand truck and off she goes. Result—a net saving in time and cost.

The company has no set policy for hiring women or for using them on specific jobs. The employe relations department acts as coordinator between the various operating departments. Department operating heads, being most familiar with the jobs to be filled, recommend whether or not a woman can do the work. After that it is trial and error, and to a large extent depends on the individual worker.

Women work the same hours as men, have the same rest periods. In certain cases the lunch period has been increased from 30 minutes to a full hour. When women are hired, they receive the same entrance-labor pay as men.

The company is making investigations preliminary to developing placement or aptitude tests for women for plant jobs. At present no satisfactory tests have been found, it is said, and the selection of applicants is largely "by guess and by gosh".

There is no maximum specification for weight-lifting; if the work involves very heavy lifting, men are used. There are no set qualifications for age or prior experience, either. The company officials have found little guide in these matters except their own judgment of the individual and the job opening for which she is being considered.

First step in the "induction" of a new woman employe for the plant or refinery is a supervised, detailed tour of the property. During this time, plant operations are explained and at each point where injury is likely to occur, those safety precautions are emphasized which are necessary to avoid injury to the worker or to others. After that, she goes to the job she has been hired to fill. Depending on the nature of the work, she receives classroom instruction or else learns while on the job under a competent supervisor. From then on she is on her own.

The company has provided separate restrooms and change rooms for women. Coveralls have been designated as the uniform on the job—clothing that will cover and protect as much of the body as possible. High-heeled shoes or shoes made of soft leather are prohibited on the job. Where night-shift work is involved, the company furnishes transportation to transfer points.

The management says of its program: "There is a lot to learn about converting manpower to womanpower but diligent planning, careful study and the friendly cooperation of pioneers on this new war labor necessity will enable us to meet this new emergency."

Working on the tank car loading rack. This girl was a store clerk for 5 years; her husband has a construction job with the Navy

Former housewife, now a warehouse helper. Her husband is in the Army Air Corps

Bottle washer in the laboratory, this 21-year-old girl has worked in a bakery and laundry among other jobs

LEFT—Applying a sprayed aluminum coating to a bubble tower surface. RIGHT—Building up the surface of a worn pump plunger by metal spraying

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Protecting Refinery Equipment By Sprayed Metal Coatings

"Metallizing", or metal spraying, is becoming more important in wartimes as a means for conserving critical materials and for general maintenance and repair in refineries and natural gasoline plants. The coating, of the metal or alloy required to withstand the particular conditions causing difficulty, is sprayed on the surface to be protected and generally requires much less critical material or expensive equipment than when plating or lining is applied.

In addition to metals, some authorities report that certain plastics and rubber-like substances may also be deposited on a solid surface by a standard-type powder gun. Pump rods, bearing surfaces and other moving parts of critical equipment may be repaired when worn or scored, or protected against various types of corrosion at a saving computed both in man-hours and critical materials required in manufacturing a new part. (1).

Among oil companies using metallizing to protect equipment is the Continental Oil Co. General superintendent of its Ponca City refinery, D. R. Johnson, and his former assistant, E. K. Dewey, Jr., now in military service, have reported extensive use of metallizing (2,3). Subsequent experience, except in matters of material costs and application speeds, which changing times and improved equipment have changed, is said to have not altered their faith in this method of protecting refinery equipment. Accordingly, much of the information in this article is based on their reports.

Metallizing originally was considered as a process whereby any metal which could be drawn into a wire or reduced to powder form could be applied to any solid surface. Now, it is necessary to expand this definition to include any fusible substance which can be drawn into wire or powdered. In this connection, it is reported that "Thiokol", a rubber-like compound, can be applied in this manner.

Two Types of Spray-Guns

Spray guns for metallizing are of two general types: wire and powder. The wire type is reported to be in most common use in this country, while the Schori powder spray-gun, widely used in Europe, is a comparatively recent importation. An advantage claimed for the Schori gun is that powdered metals may be blended in different proportions to provide an alloy coating of the desired protective properties.

The wire type gun, generally weighing between 2¾ and 4 lbs., depending on size, is provided with wire of the desired metal, pulled into the gun by an air-turbine-and-gear mechanism. Heat to fuse the metal is furnished by acetylene or propane, burning in oxygen, and the fused droplets are picked up by compressed air and blown into the field of deposit. Gas and oxygen are mixed in the gas nozzle which encases the wire nozzle; both are encased by the air nozzle.

When the gas is ignited, the wire passes through the cone of flame, fuses, and is picked up by the cold air cone. The droplets of metal are estimated to travel up to 30,000 ft. per minute, but the temperature of the droplets at the point of deposit is said to be less than 200°F. This latter is postulated because the surface produced does not fuse or blend with the base metal, apparently adhering because of minute irregularities in the surface coated. Structure of the coating differs from plated or cast metal, being a "leafing" of tiny particles of semi-fluid metal rather than an homogenous coat.

Typical Metallizing Applications

Typical applications of metallizing within the refining industry have been on cracking unit reaction chambers, dephlegmator towers, bubble towers, evaporators, lubricating-oil contact kettles, pump rods and plungers. Among applications by oil companies are also included storage tanks, and drums, ends of pipe-still

tubes, exchanger-tube sheets, heads and shells. Strict observance to details and precautionary measures are essential to success, authorities state.

The following paragraphs represent Continental Oil Co's procedure (3), and while admittedly there is controversy at the present time over this subject, it is presented here as a basis from which other groups may adapt or develop their own technique as individual needs dictate.

"A proper engineering study is a necessary preliminary to a successful application of metal spraying. It should be ascertained whether corrosion, erosion or abrasion is involved before deciding on the material to be used. If pure abrasion or erosion is involved, high-carbon steel is usually adequate. Where pure corrosion is concerned, the corrosive should be studied, since a number of suitable metals or alloys may be at hand. For all-around resistance, 18-8 stainless steel would probably be the best; but under many circumstances, much cheaper materials, such as red brass, aluminum or lead, will do as well. If a combination of corrosion and erosion is involved, 18-8 should perhaps be used.

Must Consider Thickness

"The thickness required must also be considered. If too thin, under certain conditions the coating will be permeable; and its purpose defeated. If too thick, under extreme temperature conditions differential expansion between the coating and the material being protected may result in a separation and resultant peeling or blistering. Coatings for corrosion and protection too thick for one purpose may be too thin for another application under a different set of operating conditions. For example, it would be a waste of time and money to build up a pump rod with 18-8 when pure abrasion is involved. It would obviously be equally foolish to build up a rod at great expense with high-carbon steel if the hastiest investigation could disclose that a severe corrosive condition is involved.

"We have found that the most important single factor in metallizing, either for corrosion protection or for building-up purposes, is the proper preparation of the surface to be coated. The surface should be prepared by sandblasting to pure base metal. We suggest that ordinary river sand be avoided, using only first-quality blasting sand. It has been found that the angle at which the sand blast is directed has a material effect on the bond obtained. The optimum angle is considered to be approximately 60 degrees to the surface.

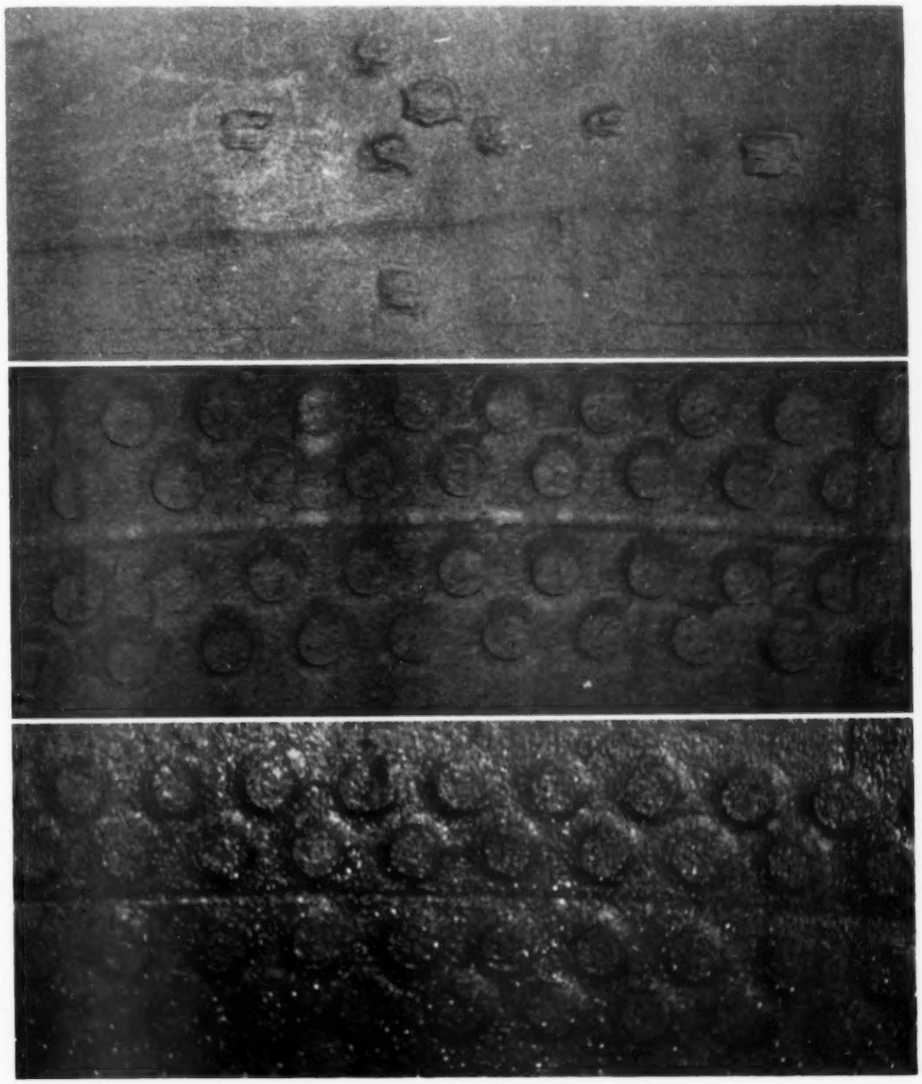
"The air used for sandblasting must be reasonably dry. The importance of keeping moisture away from a surface to be metallized cannot be overemphasized. Moisture on the surface causes the formation of a film of oxide which tends to diminish the bond materially. Even under the best of weather conditions, the area sandblasted must not exceed that which can be sprayed during the same 8-hour shift in which sandblasting is done. In moderately humid weather, metallizing should be done within 4 hours of sandblasting. Sandblasting or metallizing should not be attempted in wet weather. When preparing surfaces which have been in previous service and where coke or oil may be trapped in seams or under rivet heads, special care must be taken to remove such oil or coke. Heating with a torch is often necessary prior to sandblasting.

"In the metallizing operation itself, many of the same precautions should be taken as when sandblasting. In this portion of the operation, the operator is the most important single factor. He must be fully qualified, both as to skill and personal reliability. The gun must be well-cared for and in good condition. Very nearly absolutely dry air must be supplied to the gun. It is sometimes necessary to dry the air chemically. The size of wire used depends largely upon the gun itself. It is well to use only the highest grade metallizing wire furnished especially for this purpose, and sized closely to tolerances, despite its premium price. Gas pressure settings are important and are a function of the melting point of the metal being sprayed. (See Table 1).

"Before going ahead with the metallizing

Table 1—Gas Pressure Settings for Metal Spraying

	Approximate Melting Point (Deg. F.)	Acetylene Pressure (Pounds)	Oxygen Pressure (Pounds)	Air Pressure (Pounds)
Aluminum	1,217	15	16	75
High-carbon steel	2,560	19	20	80
Low-carbon steel	2,680	19	20	80
Lead	620	13	14	75
Monel metal	2,460	24	25	80
Red brass	1,870	18	19	80
Stainless steel (18-8)	2,550	18	19	80



Three stages in metallizing a bubble tower in a Mid-Continent refinery. Lower, original carbon-covered surface; middle, carbon removed by sandblasting; upper, surface metallized with aluminum. All pictures made with the same exposure

operation, the operator should go over the work, making certain that the freshly-prepared, sandblasted surface has not come in contact with anything moist or oily. There is a natural tendency to believe that the sandblast is merely to roughen the surface and that the heat of the metallizing spray will remove the impurities. This is definitely not the case. If there is any doubt as to the cleanliness of the surface, sandblast again."

Typical Refinery Applications

Reports received from oil companies give typical applications; some successful, and others not. Continental Oil Co. metallized the top rings and domes of two 10 ft. by 40 ft. Dubbs unit reaction chambers in January, 1934. Operating conditions were: hot oil in at 930°F., pressure of 250 lbs./sq. in., over 4 years' service, prior to metallizing, maximum corrosion rate 0.050 in. per year with an average rate of 0.036 in. per year. It was necessary to either replace the vessels at an early date, reduce pressures to a point sufficiently low to impair operating efficiency, or arrest the corrosion by some type of coating.

Inspection of the sprayed coating after 9 months showed the aluminum coating had been damaged. Peeling over an extensive area was noted, and was attributed to fact the original coat had been too thick. The areas exposed were re-sandblasted and again sprayed, but this time with 10 to 12 coats instead of the 16 to 20 coats originally used, thicknesses being approximately 0.018 in. against 0.036 in. respectively.

Failure on the rings may not have been due to the same causes as the dome failure, the inspection indicated, since the chamber had been heated to dry and spall the adhering coke prior to examination in order to facilitate inspection. Possibility was advanced that temperature was too high or that localized overheating had taken place. Repair was same as for the dome.

Inspected After 6 Months

Inspection of the repair job 6 months later found the thinner coat of metallizing in good condition except around each manhole. Here, rotary cleaning equipment had removed most of the coating. Closer examination proved, however, that the aluminum had been beaten into the steel, since it was impossible to electric weld the surface without first chipping or sandblasting. This gives rise to belief protection may exist even after the aluminum has been apparently removed.

After this successful experience, 10 additional chambers also were metallized with aluminum. In the following 4½ years there was no measurable corrosion, but an average annual replacement of 4-5% of the total area was necessary, largely due to employment of rotary cleaning equipment. Still later the equipment was converted to other uses where corrosion protection no longer is an item and no further data are available.

Metallizing Failures

Another report discusses a typical failure on a reaction chamber in an East Coast refinery: "The chamber was part of a cracking unit processing high sulfur gas oil at 920°F. and 750 lbs. gauge pressure. The work was done by a local metallizing contractor. The job was a complete failure within a few months. Faulty application was obviously responsible, since numerous chambers, operating under similar conditions, had been metallized with complete success. The effect of high humidity prevailing at the time of metallizing could have been the cause . . . a factor which could very easily have been overlooked by an inexperienced contractor."

In another case, a new, steel, clay-contact kettle, used for mixing acid-treated lubricating oil with contact clay and therefore subject to sulfur dioxide (SO_2) corrosion, was metallized in cold, damp weather before installing. After less than 2 years, inspection revealed coating had disappeared completely over approximately 5% of the area, while much of the rest was blistered or starting to peel.

Where a good bond had been obtained, absolute protection had been afforded the base metal; where it had not, losses varied from 0.020 to 0.115 in. in plate which originally was 0.500 in. thick. A similar, unprotected kettle, life of which is estimated to be 5½ years, lost as much in 1½ years' service; life of an adequately protected kettle (coating kept in periodic repair) is considered indefinite.

Metallizing Pump Rods

Metallizing of worn pump rods is a means of important savings to refiners, especially today. Some authorities say this is about the only type of metallizing they are doing now because of inability to secure alloy steel and aluminum for other applications.

One interesting saving in metallizing pump rods will illustrate a multiplicity of similar cases. One company formerly used 14% chrome stainless steel pump rods in a hot oil pump. New rods, 60 in. long, 5 in. O.D. and 3¾ in. I.D., cost $400. By making them out of low-carbon steel tubing, metallized with high-carbon steel, which experience has shown to have a life as long or longer than the stainless steel rod, the cost is reduced to $120. In addition, a hard surface has been applied to a relatively soft, ductile core; a combination otherwise available only by an expensive heat-treating or surface-hardening process. The $120 cost may be broken down to: welding $10.70; machining, $32; metallizing, $44; and grinding $33.30 — all costs including materials.

Metallizing smaller-sized rods may approach or even exceed the cost of new rods, some experts say, but this would not be important if rods were needed in an emergency or were otherwise unobtainable.

Pump-Rod Metallizing Technique

One company uses the following procedure in metallizing pump rods, although pointing out there is much disagreement among experts on what is the proper technique.

The rod is first undercut 0.0625 to 0.156 in., depending on depth of scores, after which 8 to 12 shallow threads per inch are cut. Surface then is thoroughly sandblasted to render it clean and to provide necessary roughness; it must not be handled in any way prior to metallizing. Rod is chucked in the lathe and turned so peripheral speed is approximately 30 ft. per minute; gun is supported 4 to 5 in. from the surface and moved laterally by the lathe carriage at a speed of 2½-3½ in. per minute. Three light passes are applied the full length of the rod, whence the deposit rate is increased to 6 to 8 lbs. of metal per hour. Rod is oversized 0.0625 in. total on the diameter to take care of low spots and to allow for finishing. Rod is ground, not machined, to finish dimensions.

This authority cautions that work must be continuous if job is to be successful—metallizing must begin immediately after sandblasting. Once started, metallizing must not be left overnight or for any appreciable time between coats; to do so will invite failure.

Costs and Savings

Costs of metallizing depend on many factors, among them being the personal equation of the operator, and the size of the surface to be metallized. Naturally, the larger the surface to be covered the smaller the cost per square foot. One authority estimates the cost of metallizing large towers and other similar surfaces with 18-8 stainless steel—in excess of 200 sq. ft.—as $1.75 to $2.25 per sq. ft. with the average about $2. Approximately 35-40% of this cost will be labor.

Another way of looking at costs would be to consider savings to be made. Consider a reaction chamber which costs, installed, say $25,000; shell thickness being 2.50 in. If the chamber thickness be reduced to 2 in. by corrosion, the chamber is worthless, since pressures will have to be reduced so much as to render its further use uneconomical. Then 0.50 in. shell thickness is actually worth $25,000 — 0.01 in. is worth $500. If corrosion reduced the shell thickness 0.036 in. annually in a 400 sq. ft. corrosion zone, it is worth $1800 per year to prevent it. If the corrosion area were to be coated with, say stainless steel (aluminum might be better in some cases) at $2 per sq. ft.—the cost estimated for areas over 200 sq. ft. by one authority—the initial cost of metallizing would be $800. A net saving of $1000 if the fact that the chamber eventually will become obsolete is entirely ignored.

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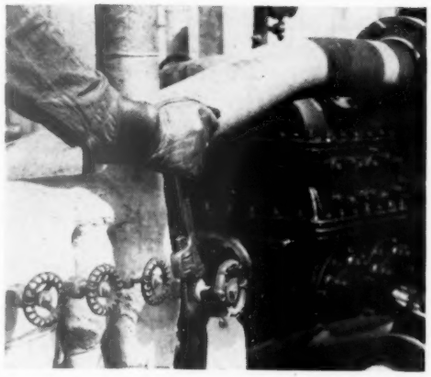
Conserving Steam To Meet Wartime Load on Boilers

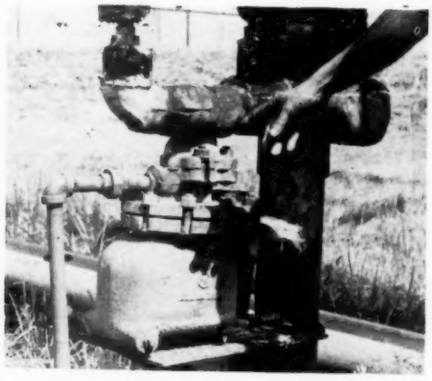
762.1



Tighten valve on stuffing boxes as soon as a leak develops to conserve steam and also save the packing

Keep pump stuffing boxes tight; their adjustment is necessary to efficient operation of pump and should be part of operator's duties

Keep steam traps in repair. A trap "blowing through" as illustrated here may waste $800 worth of steam a year



Stop leaks in fittings as indicated here. Leaks from this source can waste $200 worth of steam around a refinery in a year

CONSERVING steam is becoming a pressing necessity in many refineries where new processes have been installed to make war products, without a corresponding expansion in boiler capacity. Many plants, according to boiler men and refinery heads, now are driving their boilers as high as 250% of rated capacity.

As an illustration, one small plant customarily carried 125-150 lbs. per sq. in of steam in its boilers before installing equipment to make the new products. Now boilers carry 160-180 lbs., even though boiler capacity still is adequate for present demands.

In one large refinery, boilers are running up to 250% of rated capacity, admittedly as high as they can be driven without losing too much water, but still it has recently been necessary to purchase a second-hand boiler for suitable reconditioning in order to furnish the steam requirements for new units ready to go on-stream.

In another large plant, steam is being "rationed" so new units producing war products may operate. This situation was caused by shortage of materials necessary to complete additional boiler capacity by the time needed. This refinery manager told his men: "We can either save enough steam from our present uses to start the new plants, or we can shut down some of the less essential equipment. One thing is certain: these new units must go into operation as soon as possible."

Boiler men say that, while a boiler is expected to run for prolonged periods at 150% of rating, or even higher, continuous driving at materially over 200% of rating seriously reduces its service life and may cause foaming, priming, or other troubles as well. A reduction of 10 to 15% in steam consumption to avoid running the boiler at 200% or more of rating will materially lengthen its life, authorities say.

Another important economy results from saving steam, aside from increased boiler life. At or above the critical point of steam output, boiler efficiency drops sharply. Moderate steam saving then results in a proportionately greater fuel economy than at other, non-critical points of operation.

Many Ways to Save Steam

There are many ways to save steam around refineries and gasoline plants, authorities say. While each of itself saves relatively little steam, considered in the aggregate the amount may easily reach an unexpectedly large total. Corresponding saving in fuel costs will be a sizeable sum. Because many of these "kinks" are obvious, and only small quantities of steam are involved in each case, many plants ignored them in the past because it was felt then that the work necessary to put them in operation was not justified by the resultant savings. In wartime operations, with larger steam requirements and faced with the need for conserving fuel, whether oil, coal or gas, the importance of all means for saving steam is recognized.

One Mid-Continent refinery effects a three-point saving by running full condensing. Not a wisp of steam in this plant but what must give up all its heat content to profitable operation before it returns to the boiler.

Steam from the hot-oil pumps at an average exhaust pressure of 50 lbs. per sq. in. is either passed to a heat exchanger built from salvaged steel, or first used to operate low-pressure pumps wherever possible and then charged to the exchanger. In the exchanger, steam meets incoming raw crude charge stock in counter-current flow, raising the temperature of the latter from tank temperature to 300-400°F.

Steam leaving the exchanger, by now both low pressure and low quality, enters an atmospheric condenser. Here it gives up the balance of its heat in preheating boiler feedwater, generally to a temperature of 140-160°F. This refinery head explains his triple-savings thus:

Raw feed stock is heated to 300-350°F. "for nothing" (since if the steam be exhausted to atmosphere or condensed for make-up feedwater, heat would not be most economically utilized); all boiler feedwater is preheated to 140-160°F., again "for nothing", and treatment of that much raw water (represented by the condensed steam) is avoided, resulting in an additional saving in cost of chemicals which would be otherwise consumed. This particular plant, he says, secures one-third of its boiler make-up water in this manner, the other two-thirds being represented by losses in processing, where much of the steam becomes so contaminated with chemicals as to make purification uneconomical if not impractical.

By these two wrinkles alone, preheating boiler feedwater by condensing waste steam in it and by using exhaust steam to preheat raw crude feed, this refiner estimates he saves several hundred dollars per month in fuel costs. His boilers are driven at approximately 150% of rating.

In another company's refinery, it has long

been the rule *never* to use high-pressure steam where low-pressure or exhaust steam can be made other power; individual booster pumps supply necessary high-pressure water only where it is needed.

This same company pays close attention to steam-to-liquid ratios as well as capacities of all pumps when considering necessary power applications. The job is neither under nor over powered. Specifically, a pump having a steam-to-liquid ratio of 2:1 is never used where a 1:1 ratio will do just as well.

The Standard Oil Co. of La., in its house-organ *The Stanoclan*, issued Dec. 24, 1942, has published a list of things which can be done to save steam. While some operating details may not fit all types of refining operations, most can be adapted by refinery heads to fit their own specific needs. The Louisiana Standard list follows:

20 Ways to Save Steam at a Refinery

Use only amount of steam required.

A refinery distillation unit requires a certain amount of steam to give the best results. An amount in excess of this brings forth two evils: first, excess steam requires excess water to condense it, thus giving an increased cost; second, inferior results are obtained on the unit, resulting in a lowered capacity and effectiveness and an increase in operating cost.

Operate units at full capacity.

The amount of steam used per gallon of oil processed is less when the unit is run at its full capacity. Accordingly, where a unit cannot be run at its full capacity all the time, because of a shortage of feed stock or for some other reason, it would be well to operate part-time at full capacity, rather than continuously at less than rated capacity.

Operate pumps economically.

A pump running very slowly or very rapidly is not operating as efficiently as when it is run at a reasonable speed. See that the pump is well lubricated, and that it receives any necessary repairs.

Be careful in starting, operating, and shutting down pumps.

When starting a pump it is necessary to drain all of the water out of the cylinders and out of the live steam line, but it is not necessary to release a whole lot of steam to the sewer, where it is wasted.

Shut down pumps when pumping is done.

When a tank is pumped out, the pump should be immediately shut down and not allowed to take air over a long period of time.

In shutting down steam pumps, close both the high and low pressure steam valves, thus giving a double block against live steam at, say 125 lbs. pressure, leaking into the exhaust line at 20 lbs. pressure.

Shut off steam siphons when not needed.

When steam siphons are used to ventilate towers, soakers, or other equipment undergoing cleaning or repair, see that the steam to siphon is cut off after the work within is completed and the men leave. These siphons use a large amount of steam.

Shut off steam to heater lines when not needed.

Much steam can be saved by cutting off the supply to heater lines in tanks, steam tracers, etc., when there is no necessity for their use, such as when the unit is down for repairs. Wherever possible use low pressure steam for heating purposes.

Watch tie-in points.

Points where the high-pressure steam lines tie into the low-pressure steam system require careful watching.

Don't use excess steam in testing.

In testing fire-steam lines and other similar equipment, do not leave the bleeders open any longer than is necessary for a safe test. Make the duration that steam is on the line as short as is consistent with a good safe test.

Maintain back pressure at 20 lbs. per sq. in.

Pumping costs rise as the back pressure increases, and mechanical costs also increase. Maintain the back pressure on your pumps at the value specified by your foreman which is generally 20 lbs. per sq. in. on refinery units. Notify him whenever this specified pressure is exceeded.

Steam on header boxes.

See that valves on steam to header boxes are tight enough to prevent serious leak-through when no steam is necessary on header box. Use only minimum amount of low-pressure steam.

Fire-steam hose hydrant connections.

We have 1,000 fire-steam hose connections in the refinery. Those valves must be watched closely by the operator to prevent leakage. Keep valves closed tightly and report leaks to your foreman or fire department.

Radiators.

Cut off radiators when not needed. Low pressure steam is valuable as it is used for process purposes.

Steam leaks must be stopped.

A very small leak can waste thousands of pounds of steam in a year's time. Stop these leaks by tightening up on the stuffing box, if it is from a stuffing box, and by reporting any other leak that needs mechanical maintenance.

Use minimum amount for preparation of equipment.

In steaming of tanks or bubble towers, do not cut in the steam and leave it cut in for long periods of time. Use only enough steam to do the job of preparation desired.

Open discharge and suction valves.

Occasionally it is necessary to "pinch down" on the discharge valve of a reciprocating or centrifugal pump in order to secure smooth operation. However, be careful to close valve only enough to give the smooth operation desired; more than this is a needless waste of steam.

In "lining-up pumps," try to use the largest and shortest line available. Always have all suction line valves wide open.

Where the character of the lines and the nature of the stock permits, you can sometimes save steam by pumping the stock at an elevated temperature. For instance, in pumping a certain grade of heavy fuel oil, the steam used can be decreased 50% by pumping at the higher temperature.

Tighten valve stuffing boxes.

The operator of a piece of equipment is responsible for seeing that there are no leaks in the stuffing boxes of steam valves. The operator should tighten up on such leaking stuffing-boxes himself, and do this as soon as the leak develops. If a stuffing box is tightened up as soon as it shows a small leak, you will be able to stop it easily, but if you let it continue to leak, it will get worse and worse as time goes on; the packing will be ruined, and you will have to call upon mechanical men to repack the valve.

The operator of the equipment is the man who is supposed to stop leaks; he has a wrench, and should use it at the first signs of such leaks. Don't call upon a mechanical man to do a job which you yourself can do without added expense. Remember, it's your unit, and anything that you can do to decrease steam costs helps your department and helps you.

Stop leaks in fittings.

At any one of many points in the refinery may be a leaking union on a small steam line. What could be easier than to block off this line from the main and tighten this union? If this had been done when the leak first developed, it is probable that the leak would have been stopped. Even if a mechanical order has to be written to take care of the leak, such a job will cost only a few dollars, while this steam leak, and many like it in the refinery, may waste steam at the rate of $200 per year.

Keep Pumps' Stuffing Boxes Tight

The adjustment of the stuffing boxes on a pump is part of the operation of that pump, and should be done by the operator. Some operators want to run to the mechanics for assistance every time a small leak develops on a stuffing box, and when a mechanic is not available, they tend to shrug their shoulders and say: "I've reported the leak, and the so and so mechanics ain't fixed it." As a matter of fact, it is the duty of the operator to adjust the stuffing box himself, unless otherwise instructed.

Keep steam traps in repair.

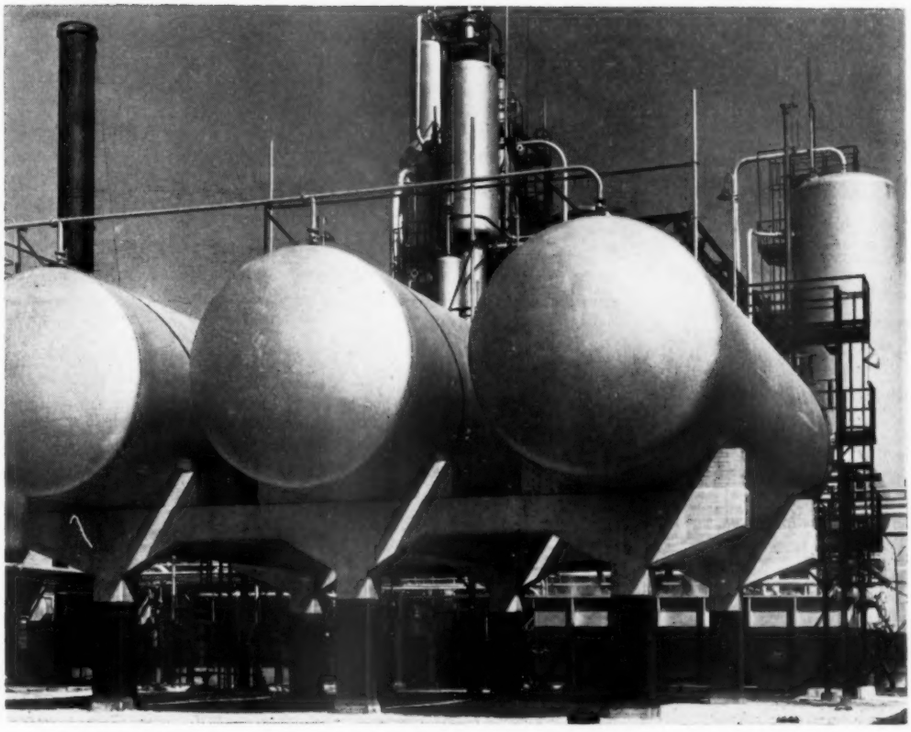
Steam traps which "blow through" are very wasteful of steam. If such a trap is wide open and blowing through, it may waste $800 worth of steam in one year's time.

The operator of any piece of equipment is responsible for the correct operation of the steam traps on that equipment as far as reporting needed repairs are concerned. He should watch them closely, just as he does his other equipment, and report any that are out of order to the pipe department, the fire marshals or utilities department. Steam traps require maintenance: like any other piece of mechanical equipment they get out of order, and where the blow-off line is piped to the sewer a defective trap can "lose your shirt" for you and sky-rocket your steam costs.

ABC of CHEMICAL DERIVATIVES from PETROLEUM

IV. Solvents *and* Plasticizers

By R. L. Wakeman[1] and B. H. Weil[2]



A solvent refining unit for the manufacture of high grade motor oils. Units of this type use large volumes of such selective solvents as propane and "Chlorex" in refining lubricating oils (Gulf Oil Corp.)

MOVING steadily along assembly lines of the aircraft industry go huge bombers and swift fighter planes. Gliding smoothly down the ways to the sea go warships and merchant vessels in great variety, hastening to make way for the hulls of their successors. Imagine the utter confusion into which this war of mass production on the home front would now be thrown if, suddenly and mysteriously, the country's knowledge of solvents were to recede to the level of World War I! Planes poised for flight to distant fighting fronts would rest for days at the end of assembly lines, waiting for old-fashioned paints to dry. Ships ready to carry men, supplies, and striking power to the corners of the earth would long lie idle in their cradles, waiting for their finishes to harden, thus delaying new production. Indeed, the very fabrication of these instruments of war would be much retarded, for modern solvents play important parts in degreasing operations as well as in protective coatings applied to component metal parts.

Solvent technology, of course, was given a tremendous impetus by World War I. Typical is the story of acetone and butyl alcohol. In the early days of that great struggle acetone did not find wide solvent use. Limited amounts only were obtained by fusion of acetate of lime, product of the wood-distillation industry. With 1914 came a demand for unprecedented volumes needed for the purification of nitro-cellulose destined for explosives. The supply of acetate of lime derived from pyroligneous acid was entirely inadequate to meet the need. Two new acetone processes therefore were developed hastily, the one starting with corn starch which was fermented by the unique bacteria, *clostridium acetobutylicum Weizmann,* the other beginning with acetylene. The latter method subsequently proved to be the harbinger of a whole new chemical industry based upon acetylene, an industry which now includes numerous other solvents among its many products.

The fermentation process for acetone led to a surprising sequence of developments. The production of every pound of acetone gave rise simultaneously and unavoidably to 2 pounds of butyl alcohol, otherwise known as butanol, $H_3C—CH_2—CH_2—CH_2—OH$. This by-product had no outlet at that time and was stored in huge tanks against the day when peacetime research should develop a market for it. When at length Mars lifted his heavy hand and such investigation became possible, it was found that butyl alcohol could be converted, by reaction with acetic acid, into an ester[3], butyl acetate,

$$H_3C-CH_2-CH_2-CH_2-O-\overset{O}{\overset{\|}{C}}-CH_3,$$

which is a volatile liquid having the odor of

[1]Pittsburgh Equitable Meter Co.'s Industrial Fellowship, Mellon Institute, Pittsburgh.

[2]Chemistry Division, Gulf Research and Development Co., Pittsburgh.

[3]An ester is the general name for the product of reaction between an alcohol and an acid:

$$\underset{\text{Alcohol}}{R-OH} + \underset{\text{Acid}}{R'-C\overset{O}{\overset{\|}{}}-OH} \longrightarrow \underset{\text{Ester}}{R-O-C\overset{O}{\overset{\|}{}}-R'}$$

banana oil and possessing superior solvent properties for nitrocellulose. Whereas only relatively expensive nitrocellulose solvents derived in limited amounts from fusel oil had been available before, comparatively cheap butyl acetate could now be used for lacquer purposes. The automotive industry was quick to seize upon this development. Slow-drying old-time varnishes were replaced with rapid-hardening nitrocellulose lacquers, and a major bottleneck in motor-car construction was eliminated!

In response to increasing demands, new processes were later introduced for the manufacture of both acetone and butyl alcohol from petroleum, thus making these solvents available in increasing amounts and at lower prices. These steps were but forerunners of many others which have led to the superior surface coatings of today, based upon the greatest variety of synthetic and semi-synthetic resins, and utilizing innumerable solvents and plasticizers in their formulation.

These developments in nitrocellulose lacquers are characteristic of the startling changes wrought by the growth of solvents during the 25 years that have elapsed since the end of the first global conflict. Older solvents, such as wood alcohol, benzol, and coal-tar naphthas, continue to play important roles, but they no longer dominate the field. An imposing number of newer ones are of equal importance today. Acetone, the butanols, and various glycol derivatives are typical examples. The birth of infants like the nitroparaffins continues to swell the ranks of potentially important solvents. These substances and many others, both old and new, are now derived in large part from a material almost unknown as a source of chemicals in 1918—petroleum!

Industrial applications of solvents are legion. Largest consumption is in paints, varnishes, and lacquers. The diversity of vehicles now available has increased vastly the number of different types of synthetic and semi-synthetic resins which can be used in the formulation of protective coatings and consequently has resulted in decreased drying time and greater versatility of paint products. Enormous volumes of such solvents as ethyl alcohol and acetone once more are required for the manufacture of explosives pouring from our arsenals of war. Liquid propane, "Chlorex," and other selective solvents are indispensable in refining high quality lubricating oils. Solvents derived in large part from petroleum play essential roles in spinning cellulose acetate rayon as well as "Vinyon," in wet extrusion of thermoplastic resins, in proofing fabrics, in coating wire with insulating lacquers, in lining tin cans with protective finishes, and in manifold degreasing operations.

Solvents are vital in such diversified industries as dry cleaning, printing, and organic-chemical manufacturing. Indeed, because many solvents such as ethyl alcohol, acetone, and benzol, for example, are individual chemical compounds rather than mixtures, a considerable number of them are used in large volumes for the production of other synthetic organic chemicals and dyestuffs, synthetic resins and plastics, synthetic textiles, and synthetic aviation gasoline!

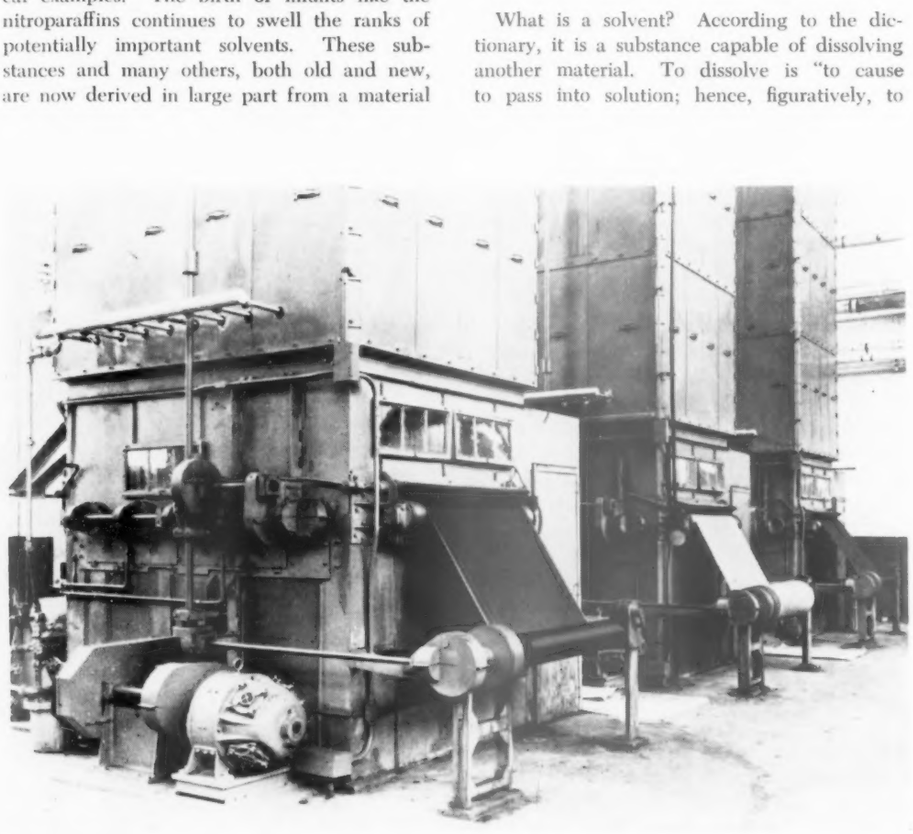
What is a solvent? According to the dictionary, it is a substance capable of dissolving another material. To dissolve is "to cause to pass into solution; hence, figuratively, to merge entirely; to melt." The ancient Greeks spent long hours in philosophical debate concerning a "universal solvent" or alkahest which might dissolve everything, and the medieval alchemists laboriously sought such a menstruum in vain. The closest approach to it appeared to be *aqua regia,* or "royal water," a mixture of nitric and muriatic acids, thus called because it dissolves gold, king of all metals. But *aqua regia* not only dissolves metals and numerous other materials, it first reacts with them, transforming them into entirely different, more soluble substances. The same is true of many other acids, bases, and various reactive fluids. Superficially, these liquids seem to meet the dictionary definition of solvent, for they cause to pass into solution those materials for whose solvation they are intended.

Modern industry, however, has found great need for non-reactive solvents which, at any desired moment, can be made to evaporate, leaving behind their burden chemically unaltered. Consequently the modern solvent is a liquid agent which, without causing chemical reaction, is capable of dissolving solids, gases, or other liquids. Water is of course the most common, the cheapest, and the most important of all solvents, but most of those which must be made by man are organic liquids. Hence petroleum and natural gas, veritable treasure chests of organic materials, have become the logical sources of many of these substances.

Unlike synthetic resins and plastics, synthetic rubbers, and textiles discussed in preceding articles of this series, the molecular edifices of solvents are relatively simple in structure, having only a small number of atoms. Ethyl alcohol, $H_3C—CH_2—OH$, for example, is built up of a total of 9 atoms of carbon, hydrogen, and oxygen. Benzol, C_6H_6, contains but 12 atoms of carbon and hydrogen.

To be of commercial importance these simple molecules must possess certain properties which are reflected in the behavior of each solvent. Volatility is a key factor, for it serves as a guide to the rate of evaporation. It is dependent upon several molecular characteristics, including latent heat of evaporation[4], chemical structure, and degree of molecular association[5], as well as boiling point. Because the last property is ostensibly the most important in determining the rate of evaporation of a liquid as well as the temperature required for its adequate dissipation from a coated surface, solvents are usually divided roughly into 3 broad classes: (1) low boilers, distilling below 100°C. at normal pressure; (2) medium boilers, which distill within the range of 100° to 150°C.; and (3) high boilers, those which distil at temperatures higher than 150°C.

Degree of inflammability is also an important property, measurable by an experimentally determined flash point. Noninflammability is



Typical of the many uses of solvents in industry are these vertical treating machines which impregnate paper and fabric with alcoholic solutions of phenolic resins for the manufacture of laminated plastics. (Micarta Division Westinghouse Electric & Manufacturing Co.)

[4]Latent heat of evaporation is a measure of the amount of heat required to vaporize a liquid at normal pressure. It varies greatly from one compound to another.

[5]Molecular association is a loose physical pairing of different molecules without establishment of actual intermolecular chemical bonds.

often demanded where low-boiling solvents must be used in large quantities, as for dry cleaning. Dilution ratio[6] is another factor of utmost economic importance in the formulation of nitrocellulose and cellulose ester lacquers. It is a measure of the extent to which a given inexpensive diluent[7] can be used to replace a more expensive solvent. The importance of toxicity need hardly be stressed; several important solvents are slowly losing ground because they are relatively toxic. It is most essential to health of workers to use properly and safely all hazardous chemicals.

Solvents from petroleum are of 2 types: (1) individual hydrocarbons or mixtures of hydrocarbons, such as naphtha cuts; and (2) chemical derivatives of hydrocarbons. Certain solvents of the first class have long been in use, but important additions to this group have been made in recent years. The second class, perhaps the more important, is scarcely 25 years old, with most of the developments dating from the last decade.

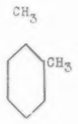
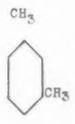
Hydrocarbon Solvents

In recent years liquid propane has become of great value as a solvent for dewaxing and deasphaltizing petroleum cuts. Special naphtha cuts boiling in the range of 40°C. to 200°C. have been in use for many years as solvents for mineral and vegetable oils, fats, waxes, and rubber. They are also employed in paints, varnishes, and lacquers, in rubber cements, in textile proofing and printing, in rotogravure inks, and in dry cleaning. Being paraffinic in nature, they are not solvents for cellulose esters, nitrocellulose, or natural and synthetic resins. On the contrary, they are sometimes used in purifying oils and fats to free them from resinous impurities. Where comparable evaporation rates permit, these naphtha cuts can often be employed in place of more expensive coal-tar hydrocarbons.

For a long time coal was the only commercial source of aromatic[8] hydrocarbons. Several of these chemicals rank high among the most versatile solvents known.

Benzol, , toluol,

and the

xylols,  ,  , and

are important solvents for oils, fats, rubber, resins, cellulose esters, and nitrocellulose. Their solvent applications include the formulation of protective coatings, lacquer thinners, paint removers, and rotogravure inks. They are used for the extraction of fats and alkaloids and in degreasing operations.

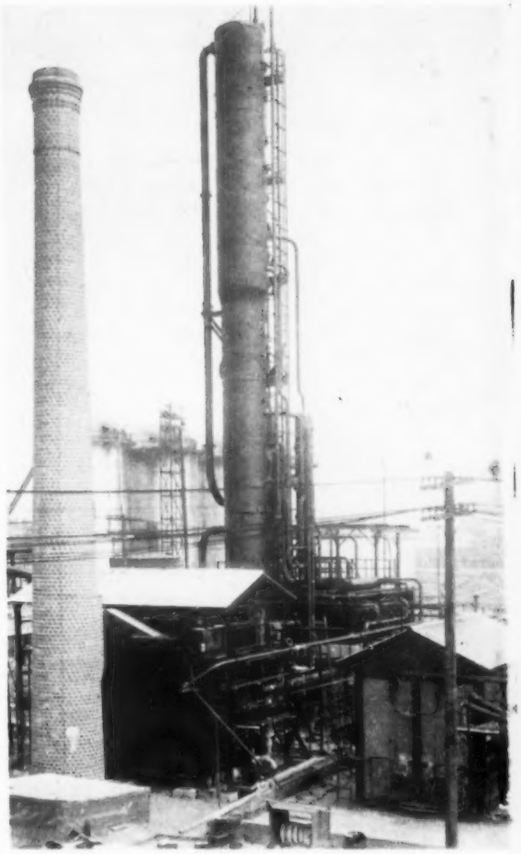
During the war of 1914-1918 some of the toluol required for T.N.T. was derived in relatively small volume from petroleum. This practice was subsequently discontinued. Today, still as a matter of wartime expediency, but this time based upon such recent technologic advances as hydroforming and solvent extraction, tremendous quantities of toluol are again coming from petroleum. The production of huge volumes of benzol will also soon be an actuality. While benzol thus produced is at present destined for consumption in chemical synthesis, its reflection upon the future of aromatic solvents can hardly be disregarded.

The trend toward the production of aromatic solvents from petroleum, however, had already become noticeable before the advent of the present war. Highly aromatic petroleum naphtha cuts, such as the "Solvessos," have become available in recent years. Produced by such refining processes as hydroforming and polyforming, or by extraction of special cuts from asphalt-base crudes, these solvents may be substituted directly for coal-tar aromatics in many uses. Their availability has been curtailed by the war because their important aromatic constituents are now extracted for conversion to explosives, aviation gasoline, and synthetic rubber.

Cyclohexane is a hydrogenated coal-tar solvent which also may soon stem from petroleum. Present to a small extent in certain naphthenic crudes, it is usually prepared by catalytic hydrogenation of benzene, soon to be derived from oil. Cyclohexane is used in lacquers and printing inks and, to some extent, for degreasing, extraction, and miscellaneous recrystallization operations. Also obtainable from petroleum are other hydrocarbons which, like ethylbenzene, are more important as intermediates in chemical synthesis than as solvents.

Chemical Solvents

Alcohols, glycols, esters, ethers, chlorinated hydrocarbons, and nitroparaffins derived from petroleum and natural gas are legion. These compounds often serve as intermediates in chemical manufacturing operations, but their most general use is in the field of industrial solvents. It was the production of isopropyl alcohol from propylene during World War I which began the long parade of chemical derivatives from petroleum bases. Hence solvents from petroleum were, in fact, the heralds of our present-day petroleum chemical in-



View of a naphtha rerun unit. Special naphtha cuts have long been in use as solvents for rubber, mineral and vegetable oils and waxes. They are employed in paints, varnishes and lacquers; in rubber cements; in textile proofing and finishing; in dry cleaning; in rotogravure inks, among other uses. (Gulf Oil Corp.)

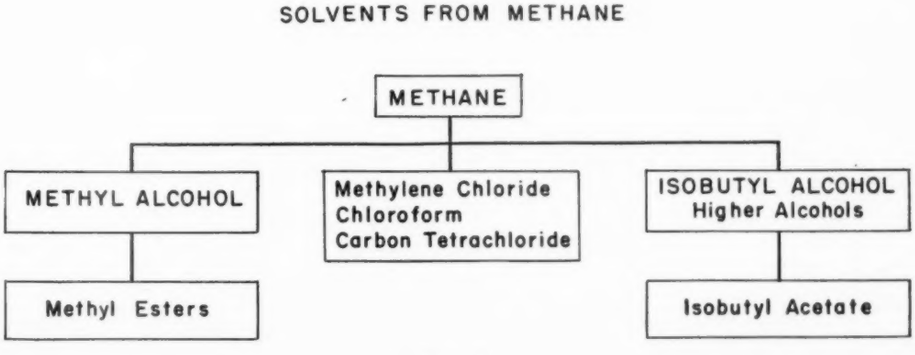


Fig. 1

[6]Dilution ratio is the maximum volume of a given nonsolvent diluent[7] which can be added to a unit volume of a solution of cellulose ester in a true solvent without effecting precipitation. The higher the dilution ratio the more valuable the diluent.

[7]A diluent is a liquid which is a nonsolvent for cellulose esters but which can be used, within limits, to dilute solutions of these resins in true solvents.

[8]An aromatic chemical is one having a benzene ring, somewhere in its structure.

dustry. Today solvents are derived from almost all the lower paraffins and olefins, and the list grows daily.

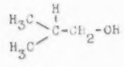
Solvents Derived From Paraffins

Of the lower paraffins (saturated open-chain hydrocarbons), methane, propane, and the pentanes find widespread employment as basic chemicals. Reference to Fig. 1 reveals the fact that such important solvents as methyl alcohol, methyl acetate, carbon tetrachloride, and isobutyl alcohol are derived from methane, the major constituent of natural gas. Chlorination reactions, such as described in the preceding article of this series[9], have been applied extensively during the past year or two for the production of chlorinated solvents. Most widely used is carbon tetrachloride which has familiar value in cleaning fluids, adhesives, and rubber cements. Methyl alcohol may be obtained by oxidation of methane or higher hydrocarbons, or by synthesis from carbon monoxide and hydrogen obtained from natural gas by the methane-steam reaction:

$$\underset{\text{Methane}}{CH_4} + \underset{\text{Steam}}{H_2O} \longrightarrow \underset{\text{Carbon Monoxide}}{CO} + \underset{\text{Hydrogen}}{3H_2}$$

$$\underset{\text{Carbon Monoxide}}{CO} + \underset{\text{Hydrogen}}{2H_2} \longrightarrow \underset{\text{Methanol}}{CH_3OH}$$

Under different conditions and over different catalysts, carbon monoxide and hydrogen produced by the first reaction are also converted to isobutyl alcohol and various higher alcohols. Methyl alcohol is an important solvent and extractant which has wide use in the manufacture of pyroxylin-base lacquers, dyes, wood stains, and textile soaps. It is employed as a denaturant for ethyl alcohol and is an important intermediate for numerous chemical reactions. Isobutyl alcohol



is an excellent solvent for gums, waxes, resins, and oils, and is utilized in the preparation of printing pastes from organic dyestuffs.

Propane is a source for the production of ethylene whose solvent derivatives will be discussed later. It is, moreover, the raw material for the manufacture of the nitroparaffins, which are among the most promising solvents and chemical intermediates developed in recent years. Those members of this class of chemicals which are at present available include nitromethane, $CH_3—NO_2$, nitroethane, $CH_3—CH_2NO_2$, 1-nitropropane, $CH_3—CH_2—CH_2—NO_2$, and 2-nitropropane, $CH_3—CHNO_2—CH_3$. The following reaction is typical of their production, being carried out in the vapor phase:

$$\underset{\text{Propane}}{CH_3—CH_2—CH_3} + \underset{\text{Nitric Acid}}{HNO_3} \longrightarrow$$

$$\underset{\text{1—Nitropropane}}{CH_3—CH_2—CH_2—NO_2} + \underset{\text{Water}}{H_2O}$$

These compounds are excellent solvents for nitrocellulose, cellulose acetate, the vinyl resins, and other synthetics. They are recommended for the preparation of inks and protective coatings. Both the nitroparaffins and several of their chemical derivatives are said to act as anti-gelling agents in synthetic rubber cements which often exhibit a tendency to gelatinize on standing in closed containers.

The pentanes, typified by n-pentane, $CH_3—CH_2—CH_2—CH_2—CH_3$, were among the earlier sources of chemical solvents from petroleum. It was found that vapor-phase chlorination of a pentane cut from natural gasoline yields chlorides which, while solvents in themselves, can be hydrolyzed to give still more valuable amyl alcohols or mixtures thereof. In the case of n-pentane, a typical over-all reaction is as follows:

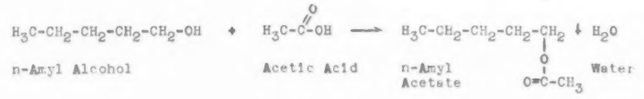
$$\underset{\text{n—Pentane}}{H_3C—CH_2—CH_2—CH_2—CH_3} + \underset{\text{Chlorine}}{Cl_2} \longrightarrow$$

$$\underset{\text{n—Amyl Chloride}}{H_3C—CH_2—CH_2—CH_2—CH_2—Cl} + \underset{\text{Hydrogen Chloride}}{HCl}$$

$$\underset{\text{n—Amyl Chloride}}{H_3C—CH_2—CH_2—CH_2—CH_2Cl} + H_2O \longrightarrow$$

$$\underset{\text{n—Amyl Alcohol}}{H_3C—CH_2—CH_2—CH_2—CH_2—OH} + \underset{\text{Hydrogen Chloride}}{HCl}$$

The alcohols, in turn, are esterified with various acids to yield esters, especially acetates:



Both amyl alcohols and their esters are solvents for ureaformaldehyde and alkyd resins. The esters are important vehicles for nitrocellulose and also find application in dry-cleaning fluids, especially in spot removers. The relationships between solvents derived from the pentanes are shown in Fig. II.

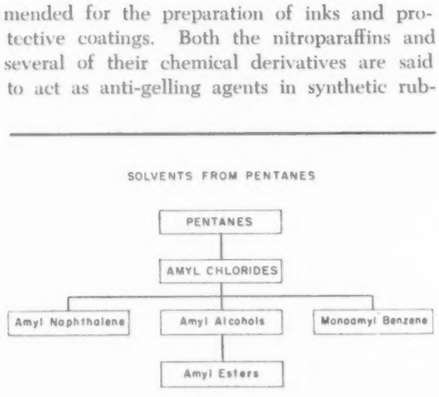


Fig. 2

Solvents Derived From Olefins

The lower olefins are prolific sources of chemical solvents. Fig. III presents the most important ones derived from ethylene. These are almost boundless in application. Ethyl alcohol, for example, is more widely used than any other solvent except water. It is employed in the manufacture of smokeless powder and cordite, cosmetic and toilet preparations, varnishes, enamels, and lacquers. It is also an important chemical intermediate for synthetic rubber[10] as well as numerous chemicals. Admixed with ethyl ether, also produced from ethylene, it is utilized as a nitrocellulose solvent, especially for the production of collodion, while alone it is indispensable in cellulose nitrate plastics fabrication. Ethyl alcohol itself can yield many other important solvents, such as n-butanol and acetone—a fact of peculiar interest because it was the production of these solvents by cornstarch fermentation that began the era of modern solvents.

The solvent derivatives of ethylene oxide

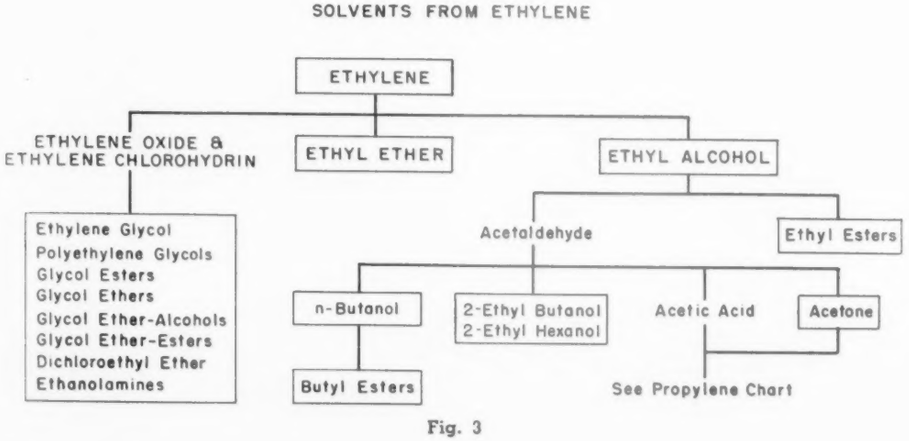


Fig. 3

[9] *National Petroleum News*, Technical Section, 35, R-65 (1943).

[10] See *National Petroleum News*, Technical Section, 35, R-29 (1943).

SOLVENTS FROM PROPYLENE

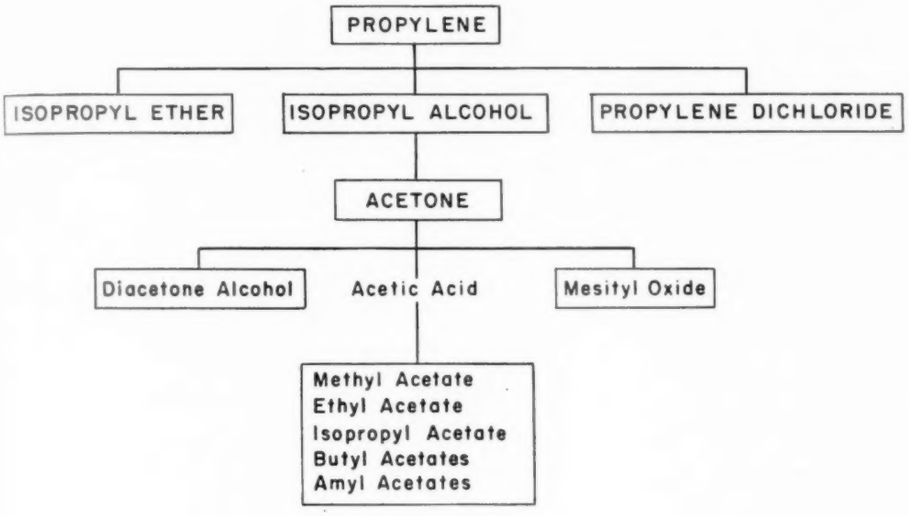


Fig. 4

and ethylene chlorohydrin are of utmost importance. Ethylene glycol, now well known to the public in such antifreezes as "Prestone," "Zerex," and "Gulf Permanent-Type Antifreeze," was one of the first commercially significant chemical derivatives of petroleum. It is produced by 2 different methods. The earlier one involves the treatment of ethylene with a reaction product of chlorine and water, yielding ethylene chlorohydrin, $CH_2OH—CH_2Cl$, which is then hydrolyzed to give ethylene glycol, $CH_2OH—CH_2OH$. The more recent method requires the intermediate formation of ethylene oxide, the over-all reactions being represented as follows:

$$CH_2{=}CH_2 + 1/2\ O_2 \longrightarrow CH_2{-}CH_2 \quad (O)$$

Ethylene — Oxygen — Ethylene Oxide

$$CH_2{-}CH_2\ (O) + H_2O \longrightarrow CH_2OH{-}CH_2OH$$

Ethylene Oxide — Water — Ethylene Glycol

Ethylene chlorohydrin and ethylene oxide are also intermediates in the formation of polyglycols and glycol esters, ethers, ether-alcohols, and ether-esters, as well as dichloroethyl ether ("Chlorex") and the ethanolamines. All these chemicals are important solvents which find wide utility. For example, the alcohol-ethers, such as "Cellosolve," $H_3C—CH_2—O—CH_2—CH_2—OH$, combining the solvent properties of both alcohols and ethers, are employed in low-cost lacquers and lacquer thinners and as mutual solvents for coupling

SOLVENTS FROM BUTYLENES

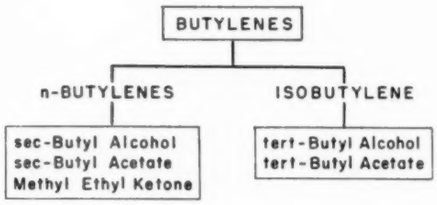


Fig. 5

immiscible liquids used in preparing cutting oils, dry-cleaning soaps, and insecticides.

Methods of preparing chemical derivatives from propylene, diagrammed in Fig. IV, have been described in a previous article of this series*. Isopropyl alcohol is an excellent solvent for use in lotions, liniments, and antiseptic solutions. It is also employed as an extractant for the purification of white oils and petroleum. Its principal derivative, acetone, is of particular importance as a solvent in the production of acetate rayon, pyroxylin plastics, and smokeless powder. Great quantities of it are used in airplane and leather "dopes," in lacquers, and in paint and varnish removers. Acetone, in turn, is used for the preparation of diacetone alcohol and mesityl oxide—powerful solvents for such substances as cellulose acetate and ethyl cellulose, and for the production of acetic acid, whose esters are in heavy demand for lacquer formulation.

The butylenes are base materials for several very useful solvents illustrated in Fig. V. Secondary butyl alcohol is a powerful latent solvent for the cellulose esters; it is used in lacquers to promote flow and leveling. Unlike the other butanols, tertiary butyl alcohol is a solid at temperatures below 26°C. It finds use in the recrystallization of certain organic chemicals, in the extraction of drugs, and as a blending agent in the preparation of disinfectants and insecticides. The manufacture of these alcohols is carried on by the general method long used for other alcohols produced from olefins. The latter are reacted with sulfuric acid and the resultant esters are hydrolyzed:

$$C_4H_8 + H_2SO_4 \longrightarrow C_4H_9HSO_4$$

Butylenes — Sulfuric Acid — Butyl Hydrogen Sulfates

$$C_4H_9 \cdot HSO_4 + HOH \longrightarrow C_4H_9OH + H_2SO_4$$

Butyl Hydrogen Sulfates — Water — Butyl Alcohols — Sulfuric Acid

It is of interest to note that work on this process, carried out with the intent of removing impurities from the alcohols, is said to have led to the first commercial method for the preparation of isooctanes for 100-octane gasoline. In the presence of cold sulfuric acid, isobutylene polymerizes to yield trimethylpentene-1 and trimethylpentene-2, which afford isooctanes on hydrogenation.

Methyl ethyl ketone is used extensively to replace more expensive solvents of similar volatility characteristics in the manufacture of lacquers and lacquer thinners. It is a solvent for the vinyl resins and is widely used for dewaxing lubricating oils. Methyl ethyl ketone may be produced from secondary butyl alcohol by oxidation, or by reacting butene-2 with hypochlorous acid, followed by the removal of hydrogen chloride:

$$CH_3—CH{=}CH—CH_3 + HOCl \longrightarrow CH_3—CHCl—CHOH—CH_3$$

Butene—2 — Hypochlorous Acid — 2—Chloro—butanol—3

$$CH_3CHCl—CHOH—CH_3 \longrightarrow CH_3—CH_2—CO—CH_3 + HCl$$

2—Chloro—butanol—3 — Methyl Ethyl Ketone — Hydrogen Chloride

Other solvents are obtained from various other olefins. The pentenes, for example, yield diamylenes, amylene dichlorides, and the amyl ethers. Olefins are most versatile building blocks for the molecular engineer, so it is probable that many more solvents will be derived therefrom in the future.

Solvents Derived From Acetylene

The solvent derivatives of acetylene are rapidly becoming of interest to the petroleum

A polyform cracking pilot-plant unit of the Gulf Research and Development Co. Units of this and similar types are utilized for the synthesis of highly aromatic petroleum naphtha solvents

industry, because large quantities of acetylene will soon be produced from petroleum hydrocarbons. Through acetaldehyde as intermediate, acetylene is the source of many solvents which are also derivable from ethylene and propylene (see Figs. III and IV). In addition, various chlorination reactions yield such important solvents as tetrachlorethane, trichlorethylene, and pentachlorethane. Trichlorethylene, $CH_2Cl=CCl_2$, is of particular importance because it is one of the solvents in greatest demand for degreasing metal parts in the manufacture of airplanes and tanks.

Petroleum hydrocarbon derivatives are thus vital in the solvents industry. To the list of those given may be added methyl isobutyl ketone, heptanone-2, diisobutyl ketone, phorone, isophorone, and numerous others produced in less volume. Petroleum-derived chemicals now include almost all the commercial important solvents, and their number and diversity will increase in future years.

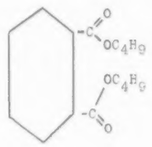
Plasticizers

Plasticizers are not solvents in the strict sense, but are usually higher analogues of some of them. Their molecular structure is sufficiently complicated so that, while still possessing sufficient solvent power to be compatible with resins with which they are mechanically combined, they are yet non-volatile or almost so. They are incorporated in thermoplastic molding compounds and in lacquers and other film-forming solutions in order to improve flexibility and strength characteristics and to reduce brittleness. They remain in the mixtures after any true solvents which may be present have evaporated. Most plasticizers possess solvent power for the resins with which they are incorporated. Some, however, are merely softeners whose effect has been attributed to their purely mechanical function as lubricants.

Among the more important plasticizers derivable from petroleum hydrocarbons are tributyl and triamyl phosphates; dimethyl, diethyl, dibutyl, diisobutyl, and diamyl phosphates, as well as phosphates of certain glycol derivatives; various tartrates, citrates, oxalates, succinates, maleates, adipates, and other esters—in fact most plasticizers are esters, although some are of different types, such as p-toluenesulfonamide,

and certain substituted ureas,

The phthalic and phosphoric acid esters are most important plasticizers. Dibutyl phthalate,



finds extensive use in protective coatings and in molding powders; it is inexpensive and has high gelatinizing power for cellulose nitrate. Diamyl phthalate is very similar, Tributyl phosphate,

is widely employed as a plasticizer for cellulose nitrate and cellulose acetate; it has the unusual toluene dilution ratio of 24, far higher than any other common plasticizer. Butyl citrate and butyl tartrate are also of some importance.

Down the assembly lines of mechanical industries roll weapons of the armory of democracy, soon to spring into action against the foe. Hidden in the background of the past and future are automobiles and other implements of peace. Many are the items of importance in the production of these mechanical marvels. Countless are their intricate parts. Yet their availability would be immeasurably lessened by a snail-like pace of production, were modern solvents to disappear; and modern solvents depend on petroleum hydrocarbons as a plentiful source of raw material.

Coming Articles In "ABC" Series

Article 5 in the series on "ABC of Chemical Derivatives from Petroleum", in the April 7th Technical Section of National Petroleum News, will discuss the application of these new types of petroleum products in the field of detergent agents and synthetic lubricants.

Suggestions as to how refinery managers and oil company executives may determine their individual company's role in the new Chemicals-From-Petroleum Industry will be taken up by the same authors in Article 6. Other articles may follow, since developments are coming rapidly in this new field for oil companies. Previous articles published in the series include:

"Synthetic Resins and Plastics", Nov. 25th issue.

"Synthetic Rubbers", Jan. 6th issue.

"Textile Fibers and Finishing Agents", Feb. 3d issue.

The Authors

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B. H. Weil

Seal Oil Systems for Refinery Centrifugal Pumps Reviewed

By Irving Taylor*

With the increasing volumes of lighter liquid products being handled in refineries today, provisions in connection with centrifugal pumps to provide their proper operation and prevent leakage take on added significance to plant operators. The accompanying article reviews different types of seal oil systems used in connection with both packing rings and mechanical seals to give proper sealing and lubrication to the contents of the packing box, including multiple installations. The author suggests that the design of the sealing oil system be considered by refiners in the engineering of new plants.

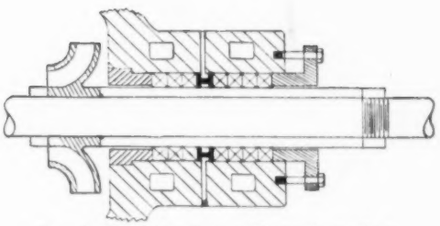


Fig. 1—Packing box with lantern ring

DURING the last few years many centrifugal pumps have been installed in this country which incorporate in their packing boxes some type of mechanical seal, either in place of or in conjunction with conventional rings of packing. It has been found by several of the oil refining companies, refinery contractors, and larger pump manufacturers that the selection and arrangement of auxiliary equipment needed for lubrication and cooling of these mechanical seals, as well as for lubrication of pump packing, often requires much more engineering than was expected. Although seal applications are now becoming better known to many of these concerns, there would seem to be need for a clarification and discussion of the problems which have arisen in this somewhat specialized field.

In this article it is not attempted to mention all the different seals and types of seal oil systems which have been tried out in refineries. However, it is the object to review the various methods whereby an individual pump is sealed, and to discuss briefly the ways in which problems are being overcome.

Mechanical Seal

If a seal is defined as an instrumentality for keeping something closed, confined, or in this case leakproof, then one might be literally correct in saying that a pump is sealed mechanically by the compressible material (packing) which is usually arranged to prevent the liquid in the pump from escaping to the outside. But a pump "packed" and sealed in this manner is not considered as having mechanical seals. So we must distinguish the "mechanical" seal from other familiar types of seals such as the water seal, mercury seal, grease seal or a packed stuffing-box. By the term "mechanical seal" we refer strictly to a device through which leakage is prevented by the juxtaposition of hard machined parts, rather than by the compression of some softer intermedial substance in the space where the fluid would escape.

In a centrifugal pump the principal parts of a mechanical seal are the two ring-shaped seal faces which both encircle the shaft side by side, as two rings on a finger. When the pump is running, one ring is rotated by the shaft against the other which is stationary; a construction somewhat similar to a single collar thrust bearing, but without appreciable thrust. These rings or collars and other parts are positioned in the packing box such that the only possibility of liquid escaping through the box would be by a separation of the seal faces. But this must not happen, so the two rubbing seal face surfaces are constantly held together; sometimes by hydraulic pressure, sometimes by a coil spring or a set of small springs arranged to press one of the rings against the other axially.

Springs are used to prevent the formation of any gap between the seal faces while the pump is stopped, and to help prevent separation which might occur due to end-play or whipping of the shaft while running. In some cases the springs rotate with the shaft, holding the rotating collar axially against the stationary collar. (The latter often serves also as the pump throat bushing or as the packing-box gland.) In other instances, stationary springs may press the non-rotating collar against the rotating one which is locked on the shaft. In either case there must be provision for a slight amount of axial sliding of one of the seal ring collars to maintain the closure constantly. To prevent any liquid from leaking past the seal through this joint of sliding, it is the practice to arrange the sliding member with a single ring of rubber or neoprene, or sometimes a metal "piston ring", to act as a flexible gasket.

The "faces" of the seal rings must be hard and smooth, and in proper alignment. Often the rotating seal ring is faced with stellite. Bronze makes the best material for the stationary face, except for installations where no lubrication is provided either by the liquid in the pump, or from the outside. In these cases stationary seal faces of carbon have been found satisfactory, although their life is not as long as that of the lubricated bronze seal rings.

Whether a refinery pump is equipped with packing or with mechanical seals, lubrication in some form is usually required for the contents of the packing boxes. The lubricant is usually called "seal oil", and is used instead of water or grease except where these mediums may be more suitable. This lubricating "seal oil", as referred to henceforth, is of course not to be confused with an oil obtained from the marine animal, the seal.

Sealing Arrangements Used

The following is a list of the various sealing methods frequently used for centrifugal pumps in refinery services:

1. Several compressible packing rings, divided into two sections by a lantern ring (sometimes called a water seal cage) which permits introduction of a lubricant near the center of the packing space. (Fig. 1)

2. Compressible packing rings and lantern ring, the same as arrangement No. 1, plus a special connection to a labyrinth type throat bushing or pressure reducing device at the inner end of the box, to permit either:

(a) *Bleeding out* a small amount of liquid from the pump to a lower pressure (to reduce pressure on the packing rings),—or—

(b) *Injection* of a different liquid from the

*Head of pump department, The Lummus Co., New York.

outside (so that packing rings will not be subjected to the liquid being pumped). (Fig. 2)

3. Single mechanical seal, usually having the rotating unit inside the box and surrounded by the liquid being pumped; sometimes arranged with a groove in the stationary seal face for introduction of a lubricant to the seal faces only. (Fig. 3)

4. Double mechanical seal, with both rotating units inside the box surrounded by a lubricating seal oil; the seal oil maintained at a pressure slightly higher than the internal pump pressure which acts at the packing box throat bushing. (Fig. 4)

Method No. 1 can generally be employed successfully for pumping services wherein the liquid being pumped is not lighter than about 0.60 specific gravity, and not corrosive or injurious to packing. It is well suited for hot oil pumps since the packing is kept from overheating where it rubs on the shaft, because the lubricant works its way in between the packing rings and the shaft in both directions from the lantern ring.

As in the packing boxes of most reciprocating pumps, a few drops of lubricant can be "dead-ended" to the lantern rings of centrifugal pumps at each stroke of an ordinary plunger type mechanical lubricator, but more often the lubricant is "circulated through" their lantern rings. Here there must be two connections to each lantern ring; one as the seal oil inlet, and the other as the outlet.

Cools The Packing

Circulating the oil through the lantern rings instead of merely dead-ending it to them will cool the packing directly, and will improve its service factor beyond that obtained if cooling is only accomplished by water-jacketing. Furthermore, operators can observe more definitely that the oil actually gets to each lantern ring (by sight flow gauges or instruments) than if dead-ending is arranged. The seal oil itself may be a gas oil, a heavy naphtha, or a lube oil, and can either be circulated by a separate pump or taken directly from a process line as a sidestream, distributed through the lantern rings, and returned into some other process line or vessel.

The question as to whether the seal oil pressure at a lantern ring should be slightly higher than the pump's internal pressure, or lower, is one of conjecture, but it is not a very vital isue. Those who favor the slightly higher pressure believe that a small amount of seal oil should always be bleeding into the pump, especially if the circulation system is separate from the process. Others feel that such a situation also produces excessive leakage of seal oil out of the ends of the packing boxes, so that they advocate a seal oil pressure not to exceed approximately 60 p.s.i. regardless of the pump suction pressure. The latter setup is more simple, and still fulfills the purpose of providing satisfactory lubrication for the packing, even if a small amount

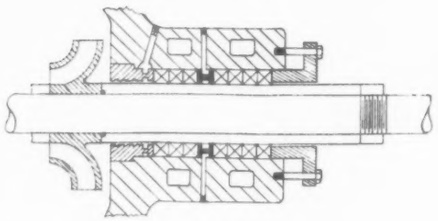


Fig. 2—Packing box with lantern ring and connection at inner end for either bleed-out or injection

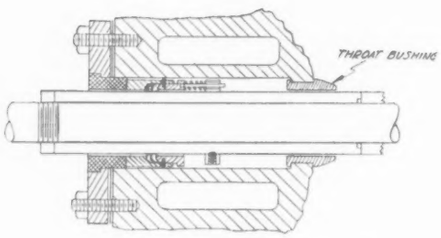


Fig. 3—A single mechanical seal

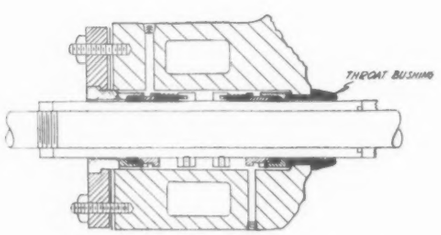


Fig. 4—A double mechanical seal

of the pumped liquid does bleed into the seal oil.

When the packing problem becomes too difficult to solve with the first method, perhaps due to a combination of very light liquid and high pressure, any of the other packing box arrangements is possible. The choice among these is dependent on the type of refinery process involved, the pump manufacturer selected, how close together the pumps will be, and the maximum pumping temperature expected.

Bleeding Eliminates Pressure

For instance, bleeding out a few gallons per minute through a pressure reducing bushing and connection at the inner end of the box is an excellent way of eliminating high pressure on the packing, *provided* that there is available in the plant a vessel at low pressure to receive the "bleed-off". Quite likely much of the liquid will change to gas (or steam) on having its pressure reduced, so this method should not be chosen without due consideration.

Likewise, injection of a heavier liquid through a similar connection and bushing at the bottom of the box can solve a packing problem wherein the liquid being pumped is very light gravity or injurious to packing. But in this case there will be a slight contamination of the liquid handled by the pump, which sometimes precludes the injection method.

If mechanical seals are chosen, the single seal would appear preferable to a double seal from a standpoint of cost and simplicity. But as yet not many manufacturers have developed a good single mechanical seal suitable for continuous duty in applications involving high pressure or lack of lubrication. For this reason the double mechanical seal has most often been selected. Since the double seal application has certain definite limitations, to be discussed presently, it is hoped that single seals will shortly be developed to such a stage that they can be applied with confidence.

The best *single* mechanical seals require no lubrication other than that provided by the liquid pumped, which surrounds the seal and keeps the seal closed by liquid pressure. When this liquid is totally without lubricating quality, the stationary seal face is made of carbon which wears but slowly. If the pressure in the pump is not too high, other single seals are being lubricated between the faces, by introduction of grease (or a few drops per minute of lube oil) through the stationary member to a groove in the seal face. A seal oil system for serving several pumps all equipped with these grooved single seals need only consist of a multi-feed power-driven mechanical lubricator with each feed piped to one single seal.

Often the outer stationary member of a single seal is arranged with a very small auxiliary packing-box on the outside, containing two or three rings of very small size packing. Between this packing and the stationary seal face is a chamber to collect any possible leakage from the single seal, for connection to the vent line or flare. This arrangement merely prevents filling the pump-room with gas, and is not intended to withstand any amount of pressure.

Double Seals

Double mechanical seals, with both units inside the packing box facing in opposite directions, have proven to be a satisfactory means of solving many difficult packing problems. The inner seal tends to be opened by the pressure of liquid within the pump with this arrangement, so a seal oil must be supplied at proper pressure to the packing box from an external source, to maintain the closure. Another seal, the outer one, is then naturally required to prevent leakage of seal oil from the flooded box to the outside.

Why go to this complicated arrangement? Because in so doing, good lubrication can be assured for both seals by using a lube oil (usually SAE-10 or 20) as the seal oil. Also, extra protection against leakage of the light gravity highly inflammable liquids being pumped at high pressures is provided by the double seal construction. Thus the advantages of double seals are long life obtained by good

lubrication and added safety, which are somewhat offset by the necessary evil embodied in the large amount of seal oil system equipment required. Double seals have not performed very satisfactorily in high temperature services or on large high-pressure multi-stage pumps having Kingsbury type thrust bearings. Perhaps this was due to a greater amount of end-play being permitted by the Kingsbury bearing than by a ball type thrust.

Experience has shown that seal oil systems which are installed to serve a group of centrifugal pumps having *double* mechanical seals are more complicated than those systems in general use for providing lubrication to a group of pumps equipped only with packing and lantern rings. This is primarily due to the fact that most of the mechanical seals in use today depend on the pressure of the seal oil which lubricates them for maintaining the closure. (The springs serve to keep the seals closed while the plant is not running.) Therefore, the seal oil pressure at each operating pump must always exceed the pump suction pressure, or the pressure existing at the packing box throat, by a safe margin, usually 25 to 50 lbs.

If the seal oil pressure should fall below the throat bushing pressure, even for a moment, the inner seal will "open", i.e., the force of the seal oil and the springs which keep the seal closed will be overcome, such that a gap will be formed between the two seal faces when the one which can slide moves back against the springs. When the gap is formed the lubricating seal oil will temporarily be contaminated with light ends; furthermore, it is possible that the seal will not close itself upon the re-establishment of greater seal oil pressure, because of sticking of the small neoprene ring or piston ring mentioned previously. Then oil will pour through the gap into the pump, which cannot be tolerated for long. So the pump must be shut down due to a combined deficiency of the seal and failure of the seal oil system. It can be seen that considerably more engineering will be involved in setting up a seal oil system with controls for assuring that seal oil pressure on each of several different pumps be kept constantly in excess of their different and variable throat bushing pressures, than in arranging for a fixed pressure throughout the system.

A question which will immediately be prompted is; "How much seal oil will get through into the pump by working between the faces of the inner mechanical seal, due to the pressure of the seal oil being slightly higher than the pump suction pressure?" The answer is, from practically nil to two quarts per 24 hours, after the first few days of operation. During this initial period the seals are "wearing in", and are consequently prone to temporary excessive leakage due to minor inaccuracies in the installation of the stationary seal rings. But the probable maximum contamination of one gallon per day from then on (by a pump with a double seal in each of its two packing boxes) is not likely to be considered objectionable in the average case. Few of the streams will be finished products anyway. One might expect to find a greater leakage of seal oil toward the outside through the outer seal, since the pressure drop across its face may be many times the 25 lbs. across the face of the inner seal. However, a greater leakage outward does not necessarily result. Perhaps this is because there is no liquid outside of the outer seal to continually absorb or entrain a small portion of the thin film of seal oil existing between the seal faces, as there is inside the inner seal.

Seal oil for double seals is seldom deadended to the packing boxes because the opportunity for a certain amount of direct cooling of the seals is thereby lost.

In operation, care must be taken that the external seal oil pump (a gear or screw type rotary) is always started long enough before the centrifugals which are being sealed to insure steady air-free flow, and left running until after the centrifugals have been stopped.

Multiple Installations

Having reviewed the different methods of arranging a packing box to seal properly under difficulties and the various manners in which its contents are lubricated, there is left for consideration the problem of arranging a seal oil system to serve a group of several pumps all fitted with double seals. To start with, assume that each centrifugal pump to be sealed will be furnished with seal oil piping manifolds for connection to the inlet and outlet connections of the packing boxes, including a valve and a pressure gauge on the inlet side, and a valve and thermometer on the outlet side. This piping should not often have to be larger than ¾-in. size, since a flow of less than 2 GPM is ample for each packing box. The main inlet and outlet of each manifold will then be connected to the lines which branch off from the seal oil system headers near each pump. Other parts of the system will consist of a seal oil circulating pump and driver, reservoir tank, seal oil cooler, (or perhaps several of these parts) plus strainers, pressure regulators, check valves, block valves, gauges, relief valve and the interconnecting piping.

Now there are about four general ways in which the seal oil headers can be piped up so as to serve all the pumps requiring circulation through their boxes. One of these would be the "series circuit", wherein the seal oil goes first to a centrifugal pump requiring high pressure, from there through a pressure regulator to another centrifugal at reduced pressure, and perhaps even through still another regulator and centrifugal before it returns to the reservoir. This type of system has not proven to be successful when applied to double seal installations due to the critical pressure limitations of these seals and resulting contaminations, particularly during starting-up periods before getting "on stream". And for circulation through lantern rings, it is usually unnecessary to maintain different seal oil pressures (or "gland" oil pressures) as previously mentioned, so the "series circuit" is not very popular.

Another piping scheme is the "parallel circuit", analagous to the electrical single phase wiring in a private house, with the same pressure existing in all the centrifugal pump boxes which are "across-the-line". This is accomplished by having only one pressure regulator, placed in the common return header, so as to hold all parts of the circuit between the seal oil pump and the regulator at the highest required pressure. (Fig. 5) Of course, this regulator should be manually adjustable.

Rather than put all the eggs in one basket in this way, it has been the practice to limit the number of centrifugals being sealed in any such parallel circuit to three, and these groups of three have been chosen from the complete list of pumps by consideration of their services and suction pressures. Usually

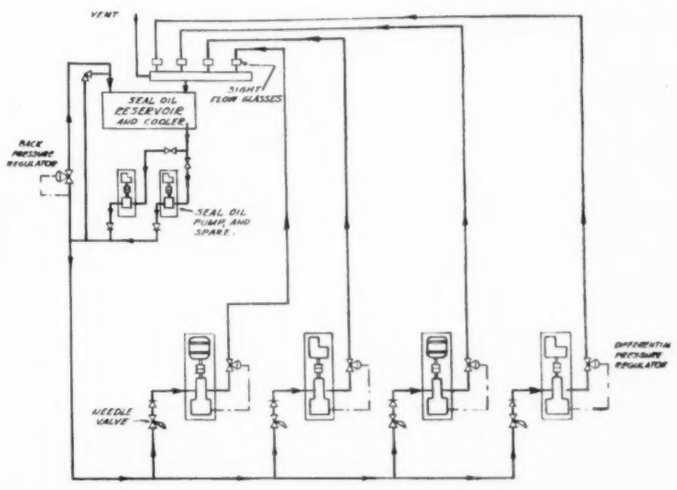


Fig. 6—"Parallel circuit" seal oil system having individual differential pressure regulators

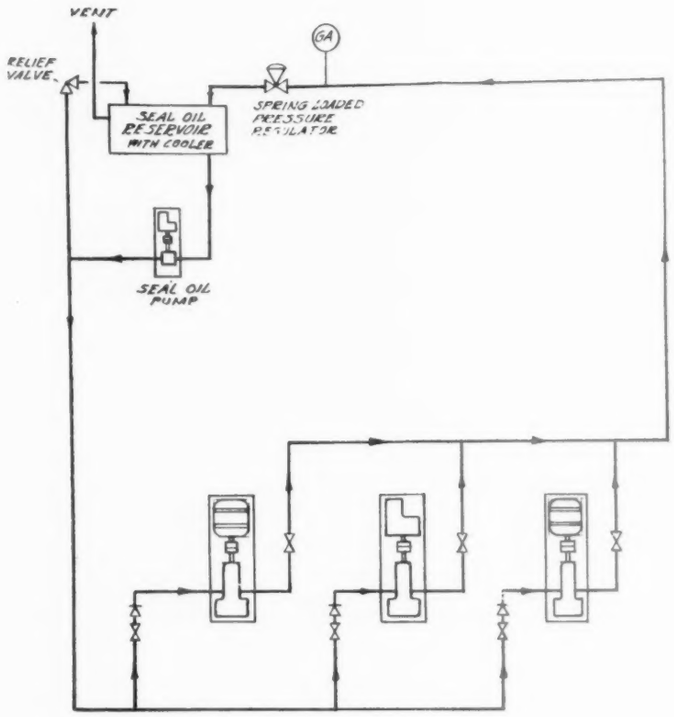


Fig. 5—"Parallel circuit" seal oil system dependent on one regulator

a spare rotary seal oil pump is also provided, which can be substituted (sometimes automatically) should any of the other seal oil pumps falter or require servicing.

It might appear then that each centrifugal pump should have its own individual seal oil system, with separate rotary pump, tank, cooler, piping, and pressure regulator. This would be a most expensive solution to the problem and must be looked upon as the extreme case.

Install 'Parallel Circuit' Systems

Today there are being installed "parallel circuit" systems for sealing many more than three centrifugals per group. The trick has been turned by putting an individual differential pressure regulator on every seal oil return line instead of depending on one common regulator (Fig. 6). Each of these pressure regulators automatically maintains seal oil pressure ahead of it at a fixed amount in excess (say 50 p.s.i.) of the corresponding throat bushing pressure, regardless of variations in the latter. By connecting a control line from the top diaphragm casing of the differential pressure regulator to a part of the centrifugal pump having throat bushing pressure, and adding a spring on top of the diaphragrm to exert 50 p.s.i., then the seal oil pressure will have to be in excess by 50 p.s.i. to balance the regulator. A needle valve or fixed orifice should be included in the inlet line to each packing box, to permit the differential regulator to spill rapidly when reducing the seal oil pressure.

In general it is advisable to drive the rotary seal oil pumps with steam turbines rather than motors, to guard against even momentary losses of pressure which might occur due to power failures.

Oil Pressure Units

The increasing use of mechanical seals requiring circulation of cooled seal oil has brought about the development of a small seal oil system in unified form, called an "oil pressure unit". By the combining, on a lightweight base, of a 30-40 gal. oil reservoir together with a small rotary seal oil pump and driver, as well as a cooler (which may be built into the reservoir), a pressure gauge, an adjustable back-pressure regulator, an oil level gauge glass, and convenient piping connections, all the elements needed are brought conveniently together. This unit can be placed in the pumphouse fairly close to the pump or small group of pumps which it serves, without need for a foundation. It is "portable" in that it need not be bolted down, and it can readily be moved or replaced with a duplicate unit as quickly as the small seal oil pipes, water cooling pipes, and electrical wiring connections can be changed. If desired, the one adjustable regulator built on to the unit could be replaced by individual automatic regulators in the return lines so as to make the system more reliable.

Conclusions

The replacement of packing by double mechanical seals in centrifugal pumps necessitates the purchase of such a considerable amount of additional special equipment that a refiner might question the advisability. However, mechanical seals that have given very fine service for 3 or 4 years are still running and have operated almost continuously with a leakage of only one-quarter pint per 24 hours per packing box, after "wearing-in". This is very satisfactory progress, justifying their use and showing that much has been accomplished toward eliminating some of the trouble, expense, hazard, and unsightliness which goes with the use of packing.

It would behoove the centrifugal pump manufacturers, or others, to continue the development of single seals which function without seal oil.

Seal Oil Systems Overlooked

Many of the refiners and contractors have undoubtedly been surprised to discover that seal oil systems were somehow overlooked or underestimated at the times of planning new refinery plants. It is hoped that this article may clarify the seal oil system and its present problems sufficiently to aid in future estimating, engineering, and operation.

Tower of the gas concentration unit in the polymerization plant of the Ashland Oil & Refining Co., now converted from making motor fuel to the manufacture of cumene for aviation gasoline

Safeguarding Fire Fighting Equipment From the Work of the Saboteur

In wartime, with its possibilities for incendiary as well as accidental fires, it is doubly important that plant fire fighting equipment be protected against the subtle form of sabotage designed to render it useless or inefficient in an emergency—but which would likely pass unnoticed until the emergency arose. In refineries and large oil storage plants the protection must include the special types of carbon dioxide and foam extinguishing systems installed there, as well as the standard water extinguishing systems. Authorities on these special systems have outlined in the following articles the importance of inspections and of sealing and housing the equipment where possible, as the most effective means for its protection against sabotage.

Protecting Carbon Dioxide Fire Extinguishers

By P. W. Eberhardt*

Development of carbon dioxide and other specialized extinguishing equipment for flammable liquid hazards has greatly simplified the petroleum industry's fire problem. But the war has introduced a new problem—guarding the extinguishers themselves against tampering and sabotage.

With carbon dioxide equipment this breaks down into two problems, protection of built-in systems and protection of portable equipment. In both cases the solution worked out by safety engineers involves a combination of housing and inspection.

With built-in carbon dioxide flooding systems the task is simplified in that the operating valves and the cylinders containing the compressed gas are permanently located away from the hazard, and thus can be locked in a separate room. Where this is not practical, the top portion of the cylinders with their release valve assemblies and direction valves are enclosed with a steel grillwork, bolted into place. The lower parts of the cylinders can be safely left exposed since it is almost impossible to damage the heavy steel casings without detection.

As a further precaution some plants have installed a warning alarm, which automatically sounds when the system is discharged. Silencing the warning can be under control of the plant engineer. Others use a supervisory light system employing a green light which remains on continuously as long as the system is ready for service, but which is replaced by a red light whenever the cylinders are discharged. The only way the green light can be turned on again is by the maintenance engineer.

In addition to such precautions the cylinders should be weighed at least once a year (preferably every 6 months). This can be done without removing the individual cylinders from the system. Each cylinder has its charged weight stamped on its neck. If it is up to this weight, no other maintenance is necessary since carbon dioxide, being non-corrosive and entirely independent of chemical reactions for its effect, does not deteriorate and does not need to be replaced until used. If, however, any cylinder is 10% or more below weight, it should be recharged immediately. See Fig. 1.

In addition, precautions should be taken regarding the exposed parts of the system—the remote operating control and the pipes through which the gas is distributed from the cylinders to the hazard. The former should be enclosed in a break-glass box which is plainly visible and kept free from obstructions. The distribution pipes may be run in the walls in new installations. In existing installations where such piping is exposed any damage may be quickly detected by visual inspection and this should be part of the duties of the regular plant patrol. In cases where the fire extinguisher pipes run with other pipes, they can be painted a distinctive color such as chrome yellow. Where color codes for piping are employed, the fire extinguishing lines should have a distinctive color.

As a final precaution the system can be blown out occasionally with a compressed air line to insure against obstruction of the lines

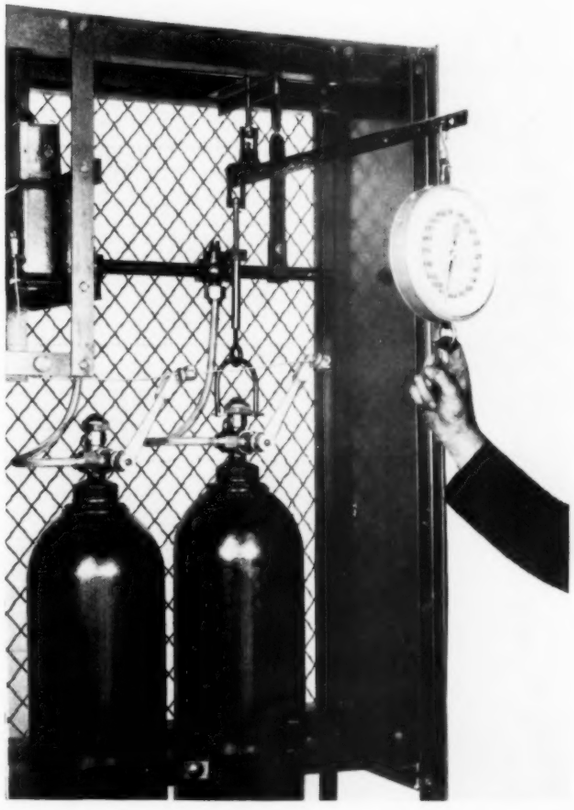


Fig. 1—Apparatus for weighing, while they remain in place, the carbon dioxide cylinders of built-in fire extinguishing system, to insure that the cylinders are fully charged

*Manager, Industrial Engineering Department, Walter Kidde & Co., Bloomfield, N. J.

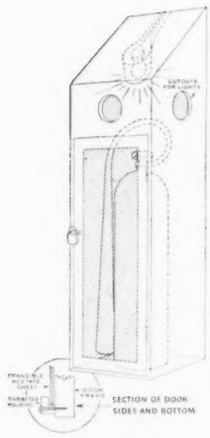


Fig. 2—Details of construction of sealed housing for portable type fire extinguishers. The opening, large enough to remove the extinguisher, is covered with cellophane or cellulose acetate in place of glass to avoid employes being cut by fragments in getting the equipment out in an emergency

and nozzles. If such blow-outs are held at irregular intervals they give greater protection against sabotage.

The most common type of portable carbon dioxide equipment used to protect oil properties are hand extinguishers of from 2-20 lbs. capacity. The best method of protecting such extinguishers is to house them in wooden or metal boxes with cellophane or cellulose acetate windows large enough to remove the extinguishers. Details of constructing such a housing are shown in Fig. 2. Cellophane or cellulose acetate is used in preference to glass in that it eliminates the possibility of employes being cut by fragments in getting at the equipment in time of emergency.

These extinguisher boxes should be mounted in easily accessible places, free from obstruction, and at a height which does not unduly strain employes handling them. The boxes enclosing the extinguishers should be painted a distinctive color such as chrome yellow (not red as this is used to mark exits, etc.) and, where possible, they should be marked with lights of the same color, particularly where operations are shut down at night time. A hard and fast rule prohibiting workmen from obstructing visibility of or access to these extinguisher stations should be strictly enforced. Sloping tops on the boxes will prevent placing anything on them. In fact, this type of boxing is also adaptable to portable extinguishers of the foam and vaporizing liquid types. The same rules apply regarding painting and keeping boxes free from obstructions.

As in the case of the cylinders of built-in systems, portables should be weighed periodically, (preferably every 6 months) to insure that they are fully charged. In cases where they may be used on live electrical equipment—in pump rooms, etc.—special care should be taken to see that the nozzles are kept clean. Excessive dirt on the insulated horn may cause a shock hazard, if brought in contact with high potential conductors.

Other types of carbon dioxide extinguishers used in the protection of oil properties include hose lines, wheeled portables, trucks and trailers. With the hoseline the cylinders can be guarded in the same manner as built-in systems.

Wheeled type portable extinguishers are too large to enclose and can best be protected by stationing them in conspicuous places. The valve should be wired and sealed, and the extinguisher checked periodically by weighing.

Fire trucks and trailers do not present a major protection problem where they are continually in the charge of the company fire brigade.

With all types of portable equipment the most important precaution of all is to make certain that any employe who may be called on to handle extinguishers is familiar with the method of operation. An extinguisher which is mishandled or discharged on the way to the fire is just as ineffective as an extinguisher that has been sabotaged.

* * *

Precautions for Safeguarding Foam Systems from Sabotage

By C. H. Lindsay*

The foam system pump house should be provided with means to prevent entrance by saboteurs when the building is unattended. Windows should be guarded with heavy metal screens, and doors securely locked. Due to the great number of valves in the pump house, it would be impracticable to lock them to prevent tampering. Also if valves were locked, valuable time would be lost in opening them during a fire.

Where the solution tanks are protected by an enclosure, as they generally are in climates subject to freezing conditions, similar steps should be taken, doors and windows being guarded to keep out the intruder. In cases where the tanks are without an enclosure, as in the South, there should be means of locking the manholes to prevent a saboteur from contaminating the solutions.

Valves in the pump house, as well as those in the field piping performing important functions, should be gate valves of the rising stem type. Such valves of the indicating type are conspicuous in either the open or closed position and would discourage sabotage.

The entire foam system installation should be frequently inspected by competent personnel, and more frequent fire drills should be conducted to permit the refinery fire department to familiarize its members with the operation of all available firefighting apparatus. Particularly, all field piping located above ground should be carefully examined at frequent intervals. By so doing, any damage done by saboteurs would be detected and repaired, and the system would be in readiness to combat a bad fire which might be caused maliciously. The tank mixing chambers, solution risers, foam hydrants, hose and all portable equipment should be similarly inspected.

In the case of foam systems using dry powder, the above-mentioned precautions are applicable. However, these chemicals are often stored in hermetically sealed containers, which should provide adequate protection against sabotage.

Standard foam systems of the type that have been in service for a number of years are not recommended for use on fires in alcohols and the ester and ether groups, or the new products now being manufactured by some oil companies. There is now available, however, a dry chemical for use in the single powder type of foam generator that is suitable for extinguishing the above-mentioned flammable liquids. For such type of protection, supplementary equipment could be provided for the satisfactory extinguishment of these fires. An additional advantage of this chemical is that it is entirely satisfactory for oil and gasoline fires, and therefore such supplementary equipment is suitable for all types of fires likely to be encountered within a refinery.

* * *

By George Blair*

In the opinion of many it is inadvisable to house foam extinguishing systems under lock and key, as the keys might not be immediately available in case of emergency.

Inspection at regular and frequent intervals should insure operatable equipment.

The most vulnerable portion of a foam fire protection system is the generator. It would be easily possible to introduce obstruction into the generator jet, thus putting it out of commission. The hoppers should be explored with a flashlight to determine whether all passages are clear.

The piping beyond the generators should be inspected to see that no lines have been broken, thus enabling a saboteur to block the line.

Tanks storing chemicals should be inspected to see that the lids are securely fastened, thus excluding any moisture which would result in chemical deterioration.

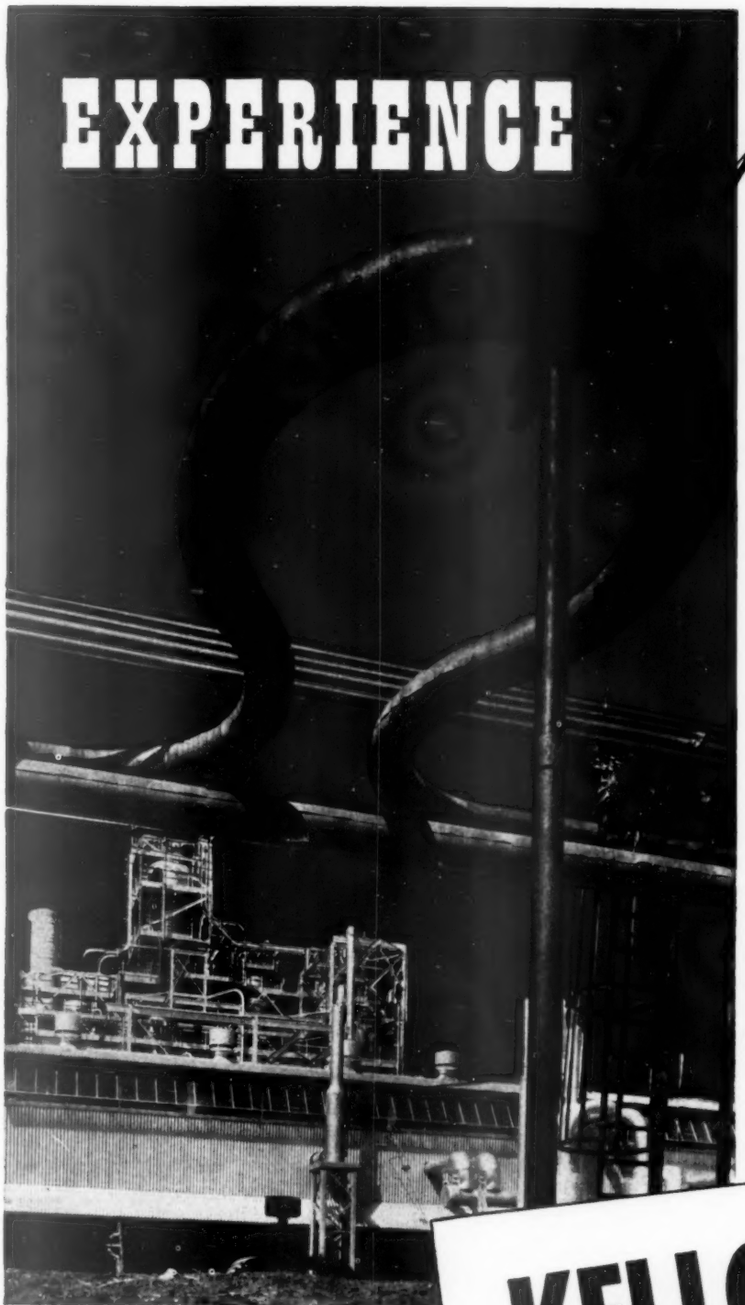
Water valves on generators should be functioned at regular intervals to determine that they are not corroded or bound in any way.

Ordinary foam such as is used on petroleum products is of no value for the protection of organic solvents such as acetone alcohol, esters, etc. A special foam chemical has been developed for the protection of these risks, and has been approved by the Underwriters' Laboratories after exhaustive tests.

Most foam chambers mounted on storage tanks are equipped with diaphragms to preclude condensed vapors from accumulating in foam lines. Diaphragms should be inspected to see that they are securely in place, and foam lines inspected and drained (if necessary) at stated periods.

*Chief Engineer, American-LaFrance-Foamite Corp., Elmira, N. Y.

*Vice-president, National Foam System, Inc., Philadelphia.



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Comparative High Temperature Characteristics Of Steels Based on Proposed 3-Year Life*

By C. L. Clark**

Characteristics of steels at high temperature take on new significance for refiners, now that their equipment is being designed for a 3-year life during the wartime emergency, as compared with a 10-year life or longer which was formerly regarded as normal. Assuming a creep rate of 3% per 30,000 hours (approximately 3 years) as permissible under these new conditions, the accompanying data shows the stress values for 3% creep for various steels at 900 to 1500 deg. F. temperature range. Also using this shorter time fracture period, the data gives stress values for rupture in 30,000 hours at 1000 to 1600 deg. F. temperature range of the same steels.

TABLE 1—Creep Characteristics of High Temperature Steels Based on 3% Creep in 30,000 Hours

(0.10%/1000 Hours)

Steel	Stress for 3% Creep in 30,000 hours at 900°F.	1000°F.	1100°F.	1200°F.	1300°F.	1400°F.	1500°F.
Carbon	16,900	5,750	1,800	620	.....	.....	.....
0.50 Mo	18,800	10,800	4,000	2,200	.....	.....	.....
DM	25,000	22,000	6,800	3,950	1,800	.....	.....
2 Cr Mo	19,300	8,900	6,000	3,500	.....	.....	.....
2¼ Cr 1 Mo	.....	11,000	7,400	4,450	.....	.....	.....
Sicromo 3M	.....	8,700	5,100	3,550	1,550	.....	.....
5 Cr Mo	15,250	10,100	5,850	2,800	1,950	.....	.....
5 Cr Mo + Ti	.....	12,000	.....	1,500	.....	.....	.....
Sicromo 5S	.....	8,700	4,800	2,900	1,450	.....	.....
Sicromo 5MS	.....	.....	6,000	3,650	1,800	.....	.....
Sicromo 7	.....	.....	3,900	2,500	1,350	.....	.....
Sicromo 7M	.....	.....	5,900	2,850	1,500	.....	.....
Sicromo 9M	.....	.....	6,200	2,650	1,500	.....	.....
18-8	.....	18,000	13,200	8,200	5,750	4,000	2,850
18-12 + Cb	.....	.....	21,000	5,300	2,000	.....	.....
16-13-3	.....	24,500	21,000	14,500	9,200	6,300	4,200

IN AN effort to conserve vital ferro-alloys, engineers are now designing equipment for a shorter life period and many in the petroleum industry have selected a 3 year time-period for this purpose. This involves careful consideration of the properties of the steels to be used, as the factors of safety are necessarily lower and premature failure will waste rather than conserve steels, thus defeating the entire program.

One of the factors to be considered is the high temperature strength properties of the steels. In the past when creep values have been used for design purposes the stresses selected have been those which produced a

*From "Resume of High Temperature Investigations Conducted during 1941-42", by Steel and Tube Division, Timken Roller Bearing Co., Canton, O.

**Research metallurgical engineer, Steel and Tube Division, Timken Roller Bearing Co.

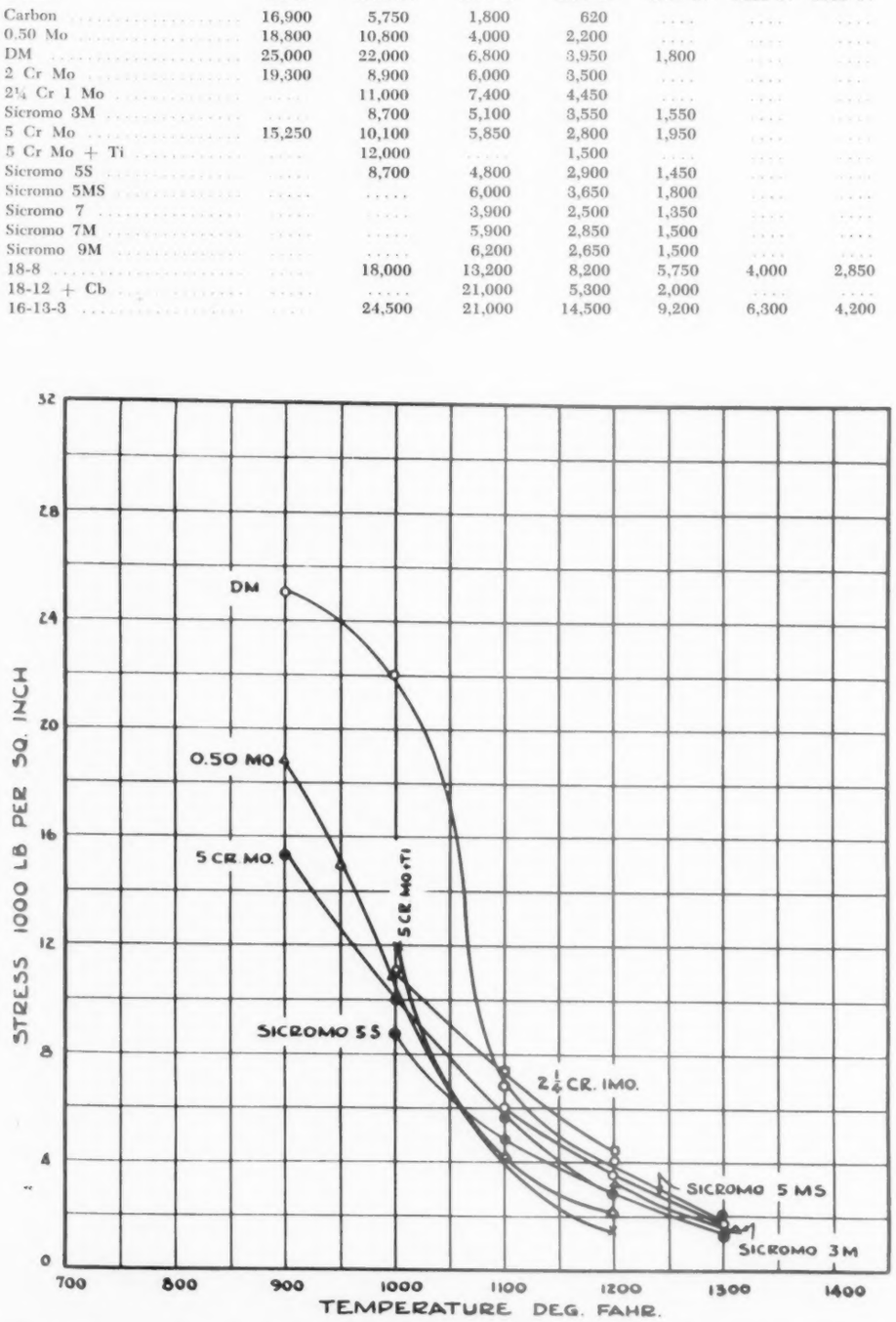


Fig. 1—Comparative creep characteristics of steels containing up to 6% chromium. Creep rate 3% per 30,000 hours (0.10% per 1000 hours)

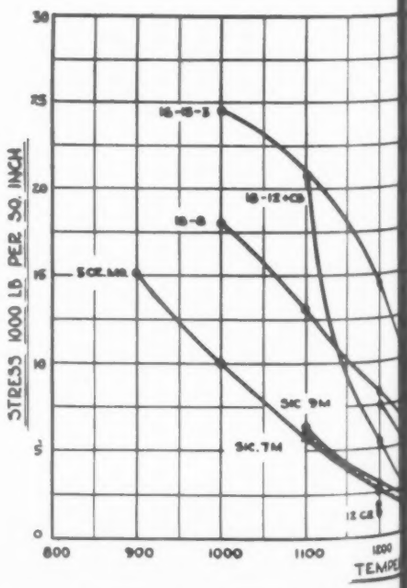


Fig. 2—Comparative creep characteristics of steels contai... rate 3% per 30,000 h... 10% per 1...

creep rate of either 0.01 or 0.10% per 1000 hours (1.0% in 100,000 or 10,000 hours). Since a 3-year life involves approximately 30,000 hours and because cracking still tubes can withstand a permissible deformation of 3.0% (provided the steel will deform to this extent without fracture), creep values are given in Table 1 for a large number of steels based on a 3% deformation in 30,000 hours. These same values are given graphically in Figs. 1 and 2, with the first figure mainly considering those steels containing up to 5.0% chromium and the second the higher chromium bearing steels.

When stress-rupture values have been used for design, many have employed the stress required for fracture in 100,000 hours, which is somewhat more than 10 years. If however, the design is to be for a 3-year period then shorter time fracture periods should be used and Table 2 presents stress values for fracture in 30,000 hours. As in the case of the creep stresses, these rupture values are plotted in Figs. 3 and 4 with the 2 figures differing in that one considers the lower and the other the higher chromium bearing steels.

Regardless of whether the given creep or rupture values are used, the factor of safety to be applied will depend to a large extent upon the given operating condition and the degree to which they may vary during any operating cycle. One of the main variables in the operating conditions may be the relative degree of surface attack, that is, either oxidation or corrosion. It is believed that the oxidation resistance of a steel with a given chromium content can be greatly improved by the addition of a proper amount of silicon. Likewise, the oxidation resistance can be maintained or improved if lower chromium bearing steels are to be substituted, by the proper increase in the silicon content.

Insofar as corrosion resistance is concerned, experience with similar petroleum products under similar operating conditions will be the best criteria as to the suitability of the various steels. This information can be supplemented, however, by results from the American Petroleum Institute's strip corrosion test which are available on the majority of these steels.

TABLE 2—Stress-Rupture Characteristics of High Temperature Steels Based On Rupture in 30,000 Hours

Steel	Stress for Rupture in 30,000 hours at 1000°F.	1100°F.	1200°F.	1300°F.	1400°F.	1500°F.	1600°F.
Carbon	3,600	.....	1,000	.....	.....	.....	.....
0.50 Mo	9,200	4,000	2,400	780	240	.....	.....
DM	19,500	9,000	3,000	1,000	.....	.....	.....
2 Cr Mo	12,500	7,600	3,800	1,400	.....	.....	.....
2¼ Cr 1 Mo	16,500	9,600	5,200	2,100	.....	.....	.....
Sicromo 3M	.....	7,200	4,400	2,700	.....	.....	.....
5 Cr Mo	16,000	7,800	3,750	2,000	.....	170	.....
5 Cr Mo + Ti	12,000	4,500	2,400	1,500	.....	.....	.....
Sicromo 5S	11,200	6,300	3,800	2,200	.....	590	.....
Sicromo 5MS	.....	8,000	4,650	2,650	.....	330	.....
Sicromo 7	.....	9,800	4,400	2,100	.....	360	.....
Sicromo 7M	.....	11,000	5,300	2,750	.....	500	.....
Sicromo 9M	.....	13,000	5,300	2,100	.....	540	.....
27 Cr N	.....	.....	2,300	.....	1,000	570	370
18-8	.....	.....	8,400	4,400	3,500	2,100	1,600
18-12 + Cb	.....	19,000	7,900	3,300	.....	.....	.....
16-13-3	.....	.....	15,000	10,500	5,400	2,400	1,150

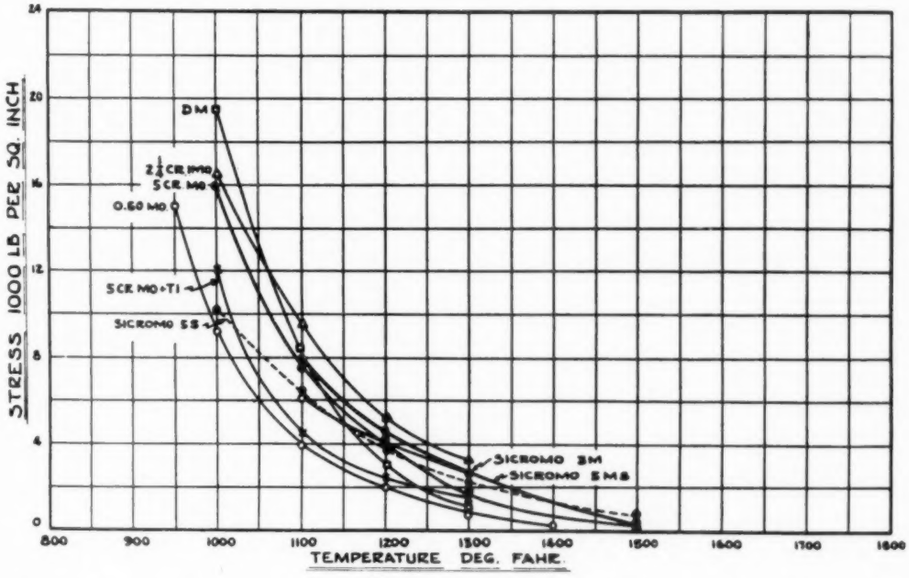
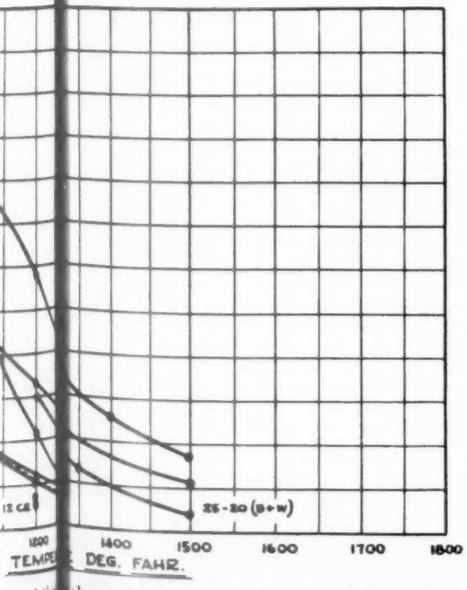


Fig. 3—Comparative rupture strengths of steels containing up to 6% chromium. Rupture time 30,000 hours



...els containing over 6% chromium. Creep ...10% per 1000 hours)

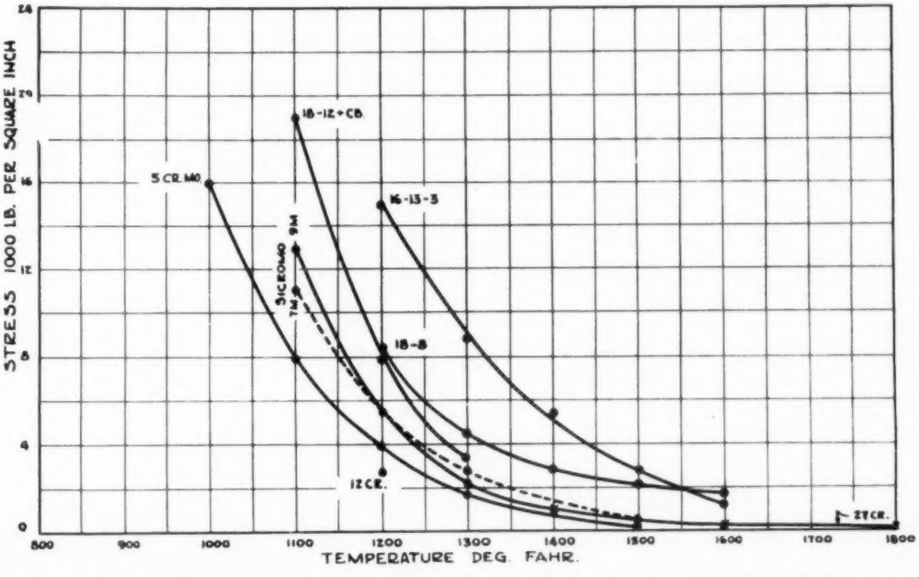


Fig. 4—Comparative rupture strengths of steels containing over 6% chromium. Rupture time 30,000 hours

Pressure-Temperature Ratings Raised For Steel Flanges, Fittings, Valves

IN THE interests of conservation of steel, the pressure-temperature ratings for steel pipe flanges and flanged fittings made from carbon and carbon molybdenum steels have been revised by a War Committee of the American Standards Assn. to provide for equipment from these materials meeting higher working pressures in many instances and still remaining within prescribed safety limits.

This action will provide for refiners to use this class of equipment for wider service than heretofore, in place of requiring equipment made from the scarce alloy grades of steel. While the revisions have been made as a war measure, if the new standards prove acceptable in service to the petroleum refining and other industries, authorities state they are likely to remain permanent standards.

The new pressure-temperature ratings are in the form of revisions of the ratings given in the American Standard Steel Pipe Flanges and Flanged Fittings, B16e, published in 1939, which includes also dimensions for flanges and fittings (of from 0.5 in. to 24 in. outside diameter pipe size) and physical and chemical requirements for the steel for this equipment. The revised ratings also apply to valves, which were not included in the 1939 standards. However, the petroleum refining industry, through the standardization committees of American Petroleum Institute, has already accepted these earlier standards as applying to valves also.

"The ratings also apply to flanged and welding end steel valves with the connecting end dimensions of the valve body conforming to B16e-1939, and which also, in other respects, merit the ratings," states the new A.S.A. bulletin introducing the revised ratings.*

The revision will make possible a greatly extended use of carbon steel, both forged and cast, it is stated, and also improves the ratings of carbon-molybdenum steels. The improvement in ratings is largely in the temperatures below the primary rating temperature and in this temperature range the maximum improvement for carbon steel is shown to be at 450°F.

The revised primary ratings, while unchanged, for flanges, flanged valves and fittings from carbon steel are based on 800°F. for other than ring joint facings, in place of 750°F. in the original table. For carbon steel ring joint facings the primary ratings are at 850°F. in the place of 750°F. For carbon-molybdenum steels the primary ratings remain at 900°F. for other than ring joint facings and at 950°F. for ring joint facings.

"Due to the considerable increase in pressure rating, the hydrostatic test pressures for carbon steel have been increased (except for the 150 series) and are equal to the present hydrostatic test pressures for carbon-molybdenum steel," the bulletin states. "Particular efforts were made to increase carbon steel ratings to meet the requirements for the use of this material as an emergency substitute for alloy steels."

The work of reviewing the pressure-temperature ratings given in Bulletin B16e had already started in 1941 under the administrative leadership of the American Society of Mechanical Engineers. Before this study could be completed, however, the war emergency arose, requiring the conservation of steels among other essential war materials. With a view toward immediate publication as a war measure, the same group of individuals, representing subcommittee No. 3 on steel flanges and fittings and subcommittee No. 4 on materials and stresses, of the A.S.A. Committee on Pipe Flanges and Fittings, undertook a partial revision of the pressure-temperature ratings based on probing calculations and experience in the use of flanges.

In August, 1942, the A.S.A., upon request of the War Production Board, applied the A.S.A. War Standards Procedure to the development of the revised ratings and appointed the same group of individuals as the A.S.A. War Committee on Rating of Pipe Flanges and Fittings. The draft of the proposed revision of ratings was submitted to individuals in various industries believed to have technical experience with this type of equipment. The revisions as approved by the A.S.A. War Committee were approved by the American Standards Assn. as a war standard on Jan. 26, 1943. They have been endorsed by a few refinery engineers to whom they were submitted before their adoption. The valve subcommittee of the A.P.I. committee on standardization of refinery equipment is now considering their inclusion in the A.P.I. valve standards.

Chairman of the A.S.A. War Committee on Rating of Pipe Flanges and Fittings is N.O. Smith-Petersen, Walworth Co. Other members include L. D. Burritt, Standard Oil Development Co.; Sabin Crocker, Detroit Edison Co.; James P. Ferguson, Reading-Pratt and Cady Division, American Chain and Cable Co.; V. T. Malcolm, Chapman Valve Manufacturing Co.; E. C. Petrie, Crane Co.; D. B. Rossheim, M. W. Kellogg Co.; J. R. Tanner, Tanner and Arnold.

Following is the introductory statement in the new bulletin, "Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings and Valves of the American Standards Assn." Tables 1-4 inclusive show the revised pressure-temperature ratings, as compared with the former ratings and charts 1-4 inclusive compare the new and old ratings graphically:

Introduction

"**General.** These ratings are the result of an investigation started in 1941 of the ratings given in the American Standard B16e-1939. Plans were then made for a complete strength examination of the flanges by use of flange stress formulas, which had been developed, used, and tested by the industry for some years. These plans involved considerable engineering work which was under way but not completed when war conditions set in requiring conservation of essential war materials. A betterment in flange pressure-temperature rating, if possible, would further this cause, and such engineering work as was completed indicated that a betterment would be possible.

"Therefore, instead of waiting for its completion, it was decided to determine the ratings by probing calculations and by approximations based on experience in use of flanges. The probing calculations revealed some information of interest which is contained in the following, and therein are also explained the principles observed and the procedure followed in determining the new ratings.

"**Flange Series.** Such calculations as were made indicated some variation in strength of flanges for the different series. In general, the 300 series is the strongest. Thereafter, in order of relative strength, come the 2500, the 600, the 1500, the 400, and the 900 series. The 150 series is not sufficiently strong to warrant any improvement in its present rating.

"**Flange Sizes.** Calculations also indicate a variation in strength of the different flange sizes within the same series. In order of strength, the small size flanges come first, next the large sizes, and last the intermediate sizes. However, there are some exceptions, therefore size ranges are not given.

"**Flange Facing.** Ratings given in B16e-1939 apply to two groups of facings: "ring-joint" facings and "other than ring-joint" facings. The ratings for the latter group at present are uniformly 83.3% of the corresponding ratings for ring-joint facings. No change has been made in the grouping, but the adverse effect on flange stress of some facings in the "other than ring-joint" group made necessary a change in the interrelation of ratings between the two groups to approximately 80%. To correlate with the latter percentage, when raised face, lapped, and large male and female facings are used with flat solid metal gaskets, it is necessary to restrict the gasket contact area to that of the large tongue and groove gasket contact area. This is noted on all tables for "other than ring-joint" facings. A special pressure-temperature rating has been set up for the

*"Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings and Valves (Revision of Tables 6 to 11 inclusive, American Standard B16e-1939). The 16-page complete booklet is published by the American Standards Assn., 29 W. 39th St., New York, and can be secured from its headquarters at 25c per copy.

300 series when the ring-joint groove is cut into the basic flange thickness. This rating is noted on Tables II and IV.

"**Flange Types.** The different flange types do not have the same strength, but are rated the same in order to maintain the existing freedom in their use.

"Requests have been made in the past for a dimensional standard and pressure-temperature ratings of slip-on-welding flanges for series above 300 psi. Therefore, to meet this demand, slip-on-welding flanges for service higher than the 300 series, which are prepared from screwed or lapped flange blanks of a material suitable for fusion welding (excluding flanges made of ASTM Specification A27-39, B and B2 material) will be permitted the same pressure-temperature ratings as screwed or lapped flanges.

"**Flange Materials.** At present only carbon steels and carbon-molybdenum steels are rated, but the number of specifications of such steels which can be given the new ratings has been increased.

"The new ratings are for the following steels and such substitutes as may be authorized by the ASTM and the ASME Boiler Code Committee.

"**Carbon Steels:**
Cast: ASTM Spec A27-39 Grades B and B2 (for screwed and lapped flanges only)
ASTM Spec A95-41°
ASTM Spec A216-42T Grades WCA and WCB
Forged: ASTM Spec A105-40° Grades I and II
ASTM Spec A181-42° Classes I and II (for 150 and 300 series only)

"**Carbon-Molybdenum Steels:**
Cast: ASTM Spec A157-42° Grade C1
ASTM Spec A217-42T Grades WC1 and WC2
Forged: ASTM Spec A182-40° Grade F1

Notes: (1) When flanges, fittings, and valves will be subject to fusion welding, the carbon content shall not exceed 0.35 per cent.
(2) The steels listed above are to be in accordance with the latest edition of the ASTM Specifications for such steels.

"**Safety Factors.** As an emergency measure similar to that introduced by the ASME Boiler Code Committee, the factor of safety has been reduced, but in no case is it less than 4 for any temperature above or below the primary rating temperature. A factor of 90% has been applied for both forgings and castings.

"**Rating Pressures and Temperatures.** The pressures and temperatures listed in the rating tables are the maximum non-shock pressures and the highest temperatures of the internal fluid obtaining at the location of the flange concerned. The present rating temperature limits have been extended for carbon steel used for steam service, except the 150 series, from 850 F to 1000 F for all facings and for carbon-molybdenum steel for all services, except steam, from 1000 F to 1100 F for ring-joint facing.

"**Flange Loading.** In order to obtain the flange stresses at primary pressure rating, the flanges were subjected to the flange loading set-up recently proposed by the ASME Boiler Code Committee. In addition thereto, a line expansion loading of 2000 psi in the flange bolting was imposed on the flanges. The 2000-psi bolting load is taken from ASA B16e, where such a loading is implied in the regulation of stress for regular flange bolting for valve bonnet flange and clean out flange bolting, etc.

"**Flange Stress Formulas.** The flange stress formulas used are those recently proposed by the ASME Boiler Code Committee (February 1942 *Mechanical Engineering*) including the stress adjustments, stress controls, and gasket properties. These formulas give maximum hub stress, maximum radial stress, and maximum tangential stress in the flange fillet or hub and the flange ring.

"**Calculations.** Calculations were made of all the different flange sizes of the 900-psi series for all types of facings and all flange types. In addition, calculations were made of an 8-inch and a 14-inch (12-inch for 2500 psi) welding neck type of flange for all facings and for series 300, 600, 1500, and 2500 psi. These calculations provide a backbone of flange stress information through the entire field of flange series, sizes, types, and facings. By averaging and by adjustments, a controlling flange stress at primary pressure was then obtained, and this stress was used to find the primary rating temperatures from allowable stress-temperature curves.

"**Rating Procedure and Results.** Flange strength calculations indicated that the primary rating temperature for carbon-steel flanges with ring-joint facings could be increased from 750 F to 850 F. The use of the safety factor of 4 indicated that the 100 F and the 750 F ratings for this material and facing could be given the same pressure rating as a given alloy steel, ASTM Specification A157-41 Grade C5A and A182-40 Grade F5, in API Standard 600A-42 and Section 3 of the American Standard Code for Pressure Piping, B31.1, at such temperatures.

"At 450 F, where the allowable stress is the same as at 100 F, a reduction in the pressure rating was considered necessary in order to allow for the possibility of inadequate designs of pipe lines at low temperatures. This reduction is approximately 10%. At 900 F and above, it was possible to give water and steam the same ratings as are given at present for oil, except the 150 series.

"These five temperature points define the new carbon-steel rating curve for flanges with ring-joint facings. For carbon-steel flanges with other than ring-joint facings, the interrelation of 80% between the rating of ring-joint facing and the rating of other than ring-joint facing defines this rating curve, except at the lower temperatures where the 80% factor gradually increases to the present 83.3% factor.

"Calculations for carbon-molybdenum steel flanges with ring-joint facings indicated that an improvement in the present 950 F primary rating was not fully warranted but that at 1000 F a 16% improvement in pressure rating could be made. It was also found possible to extend the ratings for oil to 1100 F. For temperatures from primary rating to and including 800 F, little improvement in rating appeared to be possible at present, hence present ratings were not altered. From 750 F to 100 F the ratings were made the same as for carbon steel. For carbon-molybdenum steel flanges with other than ring-joint facings, the new ratings were obtained as for corresponding carbon-steel flange facings except that ratings for oil were not extended to 1100 F."

°Now rated in A.S.A. B16e-1939.

Table 1—Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings, and Valves with Dimensions according To ASA B16e-1939

Material: Carbon Steels
Facing: Other than Ring-Joint
(Revision of Table 7 in ASA B16e-1939 Ratings from Table 7 shown only where changes occur)

Fluid	Primary Service Pressure Ratings	150		300		400		600		900		1500		2500	
	Hydrostatic Shell Test Pressures°°	350		900		1200		1800		2400		4200		7200	
	Service Temperatures Degrees F.	Maximum, Non-Shock, Service Pressure Ratings at Temperatures from 100 to 1000 F.													
		New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old
	100	230		600	500	800	670	1200	1000	1800	1500	3000	2500	5000	4170
	150	220		590	480	785	640	1180	960	1770	1440	2950	2400	4915	4000
	200	210		580	465	770	620	1160	930	1740	1395	2900	2325	4830	3875
	250	200		570	450	760	600	1140	900	1710	1350	2850	2250	4750	3750
	300	190		560	435	740	580	1120	870	1680	1305	2800	2175	4660	3625
	350	180		550	420	725	560	1095	840	1645	1260	2740	2100	4565	3500
	400	170		540	405	710	540	1075	810	1615	1215	2690	2025	4475	3375
Water	450	160		525	390	700	520	1050	780	1580	1170	2630	1950	4380	3250
	500	**150**		500	375	665	500	1000	750	1500	1125	2500	1875	4165	3125
Steam	550	140		475	360	630	480	950	720	1420	1080	2370	1800	3950	3000
	600	130		445	345	590	460	890	690	1330	1035	2220	1725	3700	2875
Oil	650	120		415	330	550	440	830	660	1240	990	2070	1650	3450	2750
	700	110		380	315	500	420	760	630	1140	945	1900	1575	3160	2625
	750	100		340	300	450	400	680	600	1020	900	1700	1500	2830	2500
	800	92		**300**	275	**400**	370	600	550	900	830	1500	1380	2500	2300
	850	82		245		330		490		740		1230		2050	
	900	70°		210		280		420		630		1050		1750	
	950	55°		165		220		330		495		825		1375	
	1000	40°		120		160		240		360		600		1000	

Notes: ° Pressure ratings for temperatures 900 to 1000 F., inclusive, of 150 series are for oil service only.
°° In the former Table 7, maximum hydrostatic shell test pressures, lbs. per sq. in. (gage) were: 150 series—350 lbs.; 300 series—750 lbs.; 400 series—1000 lbs.; 600 series—1500 lbs.; 900 series—2000 lbs.; 1500 series—3500 lbs.; 2500 series—6000 lbs.
Primary service pressure ratings are in bold face type.

Table 2—Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings, and Valves with Dimensions according To ASA B16e-1939

Material: Carbon Steels
Facing: Ring-Joint
Ratings apply also to Valves and Fittings with Welding Ends.
(Revision of Table 9 in ASA B16e-1939. Ratings from Table 9 shown only where changes occur)

	Primary Service Pressure Ratings	150		300		400		600		900		1500		2500	
Fluid	Hydrostatic Shell Test Pressures**	350		900		1200		1800		2400		4200		7200	
	Service Temperatures Degrees F.	Maximum, Non-Shock, Service Pressure Ratings at Temperatures from 100 to 1000 F.													
		New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old
	100	275		720	600	960	800	1440	1200	2160	1800	3600	3000	6000	5000
	150	255		710	575	945	765	1420	1150	2130	1725	3550	2875	5915	4790
	200	240		700	550	930	730	1400	1100	2100	1650	3500	2750	5830	4580
	250	225		690	525	920	700	1380	1050	2070	1575	3450	2625	5750	4375
	300	210		680	500	910	670	1365	1000	2050	1500	3415	2500	5690	4170
	350	195		675	475	900	635	1350	950	2025	1425	3375	2375	5625	3960
	400	180		665	450	890	600	1330	900	2000	1350	3330	2250	5550	3750
Water	450	165		660	425	875	565	1320	850	1975	1275	3295	2125	5490	3540
	500	**150**		625	400	835	530	1250	800	1875	1200	3125	2000	5210	3330
Steam	550	140		590	380	790	505	1180	760	1775	1140	2955	1900	4925	3165
	600	130		555	360	740	480	1110	720	1660	1080	2770	1800	4620	3000
Oil	650	120		515	340	690	450	1030	680	1550	1020	2580	1700	4300	2830
	700	110		470	320	635	425	940	640	1410	960	2350	1600	3920	2665
	750	100		425	300	575	400	850	600	1275	900	2125	1500	3550	2500
	800	92		365	275	490	370	730	550	1100	830	1830	1380	3050	2300
	850	82		**300**	245	**400**	330	**600**	490	**900**	740	**1500**	1230	**2500**	2050
	900	70*		210		280		420		630		1050		1750	
	950	55*		165		220		330		495		825		1375	
	1000	40*		120		160		240		360		600		1000	

Notes: *Pressure ratings for temperatures 900 to 1000 F., inclusive, of 150 series are for oil service only.
** In the former Table 9, maximum hydrostatic shell test pressures, lbs. per sq. in. (gage) were: 150 series 350 lbs.; 300 series—750 lbs.; 400 series—1000 lbs.; 600 series—1500 lbs.; 900 series—2000 lbs.; 1500 series—3500 lbs.; 2500 series—6000 lbs.
Primary service pressure ratings are in boldface type.

Table 3—Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings, and Valves with Dimensions according To ASA B16e-1939

Material: Carbon-Molybdenum Steels and Equivalent Alloy Steels
Facing: Other than Ring-Joint
(Revision of Table 10 ASA B16e-1939. Ratings from Table 10 shown only where changes occur)

	Primary Service Pressure Ratings	300		400		600		900		1500		2500	
Fluid	Hydrostatic Shell Test Pressures	900		1200		1800		2400		4200		7200	
	Service Temperatures Degrees F.	Maximum, Non-Shock, Service Pressure Ratings at Temperatures from 100 to 1000 F.											
		New	Old	New	Old	New	Old	New	Old	New	Old	New	Old
	100	600		800		1200		1800		3000		5000	
	150	590		785	775	1180		1770		2950		4915	4905
	200	580		770	750	1160		1740		2900		4830	4810
	250	570	560	760	725	1140	1120	1710	1680	2850	2800	4750	4645
	300	560	540	740	700	1120	1080	1680	1620	2800	2700	4660	4480
	350	550	520	725	675	1095	1040	1645	1560	2740	2600	4565	4315
	400	540	500	710	650	1075	1000	1615	1500	2690	2500	4475	4150
Water	450	525	480	700	625	1050	960	1580	1440	2630	2400	4380	3985
	500	500	460	665	600	1000	920	1500	1380	2500	2300	4165	3820
Steam	550	475	440	630	575	950	880	1420	1320	2370	2200	3950	3655
	600	445	420	590	550	890	840	1330	1260	2220	2100	3700	3490
Oil	650	415	400	550	525	830	800	1240	1200	2070	2000	3450	3325
	700	380	380	500	500	760		1140		1900		3160	
	750	360		475		720		1080		1800		2995	
	800	340		450		680		1020		1700		2830	
	850	320		425		640		960		1600		2665	
	900	**300**		**400**		**600**		**900**		**1500**		**2500**	
	950	265		350		530		795		1325		2205	
	1000	190		250		380		570		950		1580	

Primary service pressure ratings are in bold face type.

Table 4—Pressure-Temperature Ratings for Steel Pipe Flanges, Flanged Fittings, and Valves with Dimensions according To ASA B16e-1939

Material: Carbon-Molybdenum Steels and Equivalent Alloy Steels
Facing: Ring-Joint
Ratings apply to Valves and Fittings with Welding Ends.
(Revision of Table 11 ASA B16e-1939. Ratings from Table 11 shown only where changes occur)

	Primary Service Pressure Ratings	300		400		600		900		1500		2500	
Fluid	Hydrostatic Shell Test Pressures	900		1200		1800		2400		4200		7200	
	Service Temperatures Degrees F.	Maximum, Non-Shock, Service Pressure Ratings at Temperatures from 100 to 1100 F.											
		New	Old	New	Old	New	Old	New	Old	New	Old	New	Old
	100	720		960		1440		2160		3600		6000	
	150	710	700	945	925	1420	1400	2130	2100	3550	3500	5915	5825
	200	700	675	930	900	1400	1350	2100	2025	3500	3375	5830	5625
	250	690	650	920	875	1380	1300	2070	1950	3450	3250	5750	5425
	300	680	625	910	825	1365	1250	2050	1875	3415	3125	5690	5200
	350	675	600	900	800	1350	1200	2025	1800	3375	3000	5625	5000
	400	665	575	890	775	1330	1150	2000	1725	3330	2875	5550	4800
Water	450	660	550	875	725	1320	1100	1975	1650	3295	2750	5490	4575
	500	625	525	835	700	1250	1050	1875	1575	3125	2625	5210	4375
Steam	550	590	500	790	675	1180	1000	1775	1500	2955	2500	4925	4175
	600	555	475	740	625	1110	950	1660	1425	2770	2375	4620	3950
Oil	650	515	450	690	600	1030	900	1550	1350	2580	2250	4300	3750
	700	470	425	635	575	940	850	1410	1275	2350	2125	3920	3550
	750	425	400	575	525	850	800	1275	1200	2125	2000	3550	3325
	800	375		500		750		1125		1875		3125	
	850	350		475		700		1050		1750		2925	
	900	325		425		650		975		1625		2700	
	950	**300**		**400**		**600**		**900**		**1500**		**2500**	
	1000	230	200	310	275	470	400	700	600	1170	1000	1950	1675
All Fluids except Steam	1050	135		180		270		405		675		1125	
	1100	90		120		180		270		450		750	

Primary service pressure ratings are in bold face type.

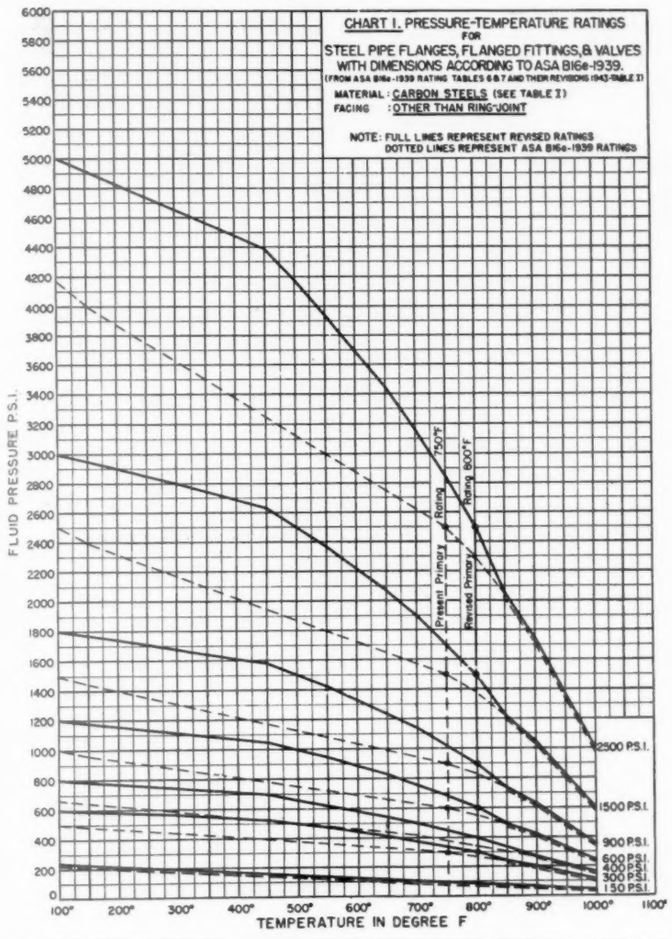


CHART 1. PRESSURE-TEMPERATURE RATINGS
FOR
STEEL PIPE FLANGES, FLANGED FITTINGS, & VALVES
WITH DIMENSIONS ACCORDING TO ASA B16e-1939.
(FROM ASA B16e-1939 RATING TABLES 6 & 7 AND THEIR REVISIONS 1943-TABLE I)
MATERIAL : CARBON STEELS (SEE TABLE I)
FACING : OTHER THAN RING-JOINT
NOTE: FULL LINES REPRESENT REVISED RATINGS
DOTTED LINES REPRESENT ASA B16e-1939 RATINGS
FLUID PRESSURE P.S.I.
TEMPERATURE IN DEGREE F
Present Primary Rating 750°F
Revised Primary Rating 800°F
2500 P.S.I.
1500 P.S.I.
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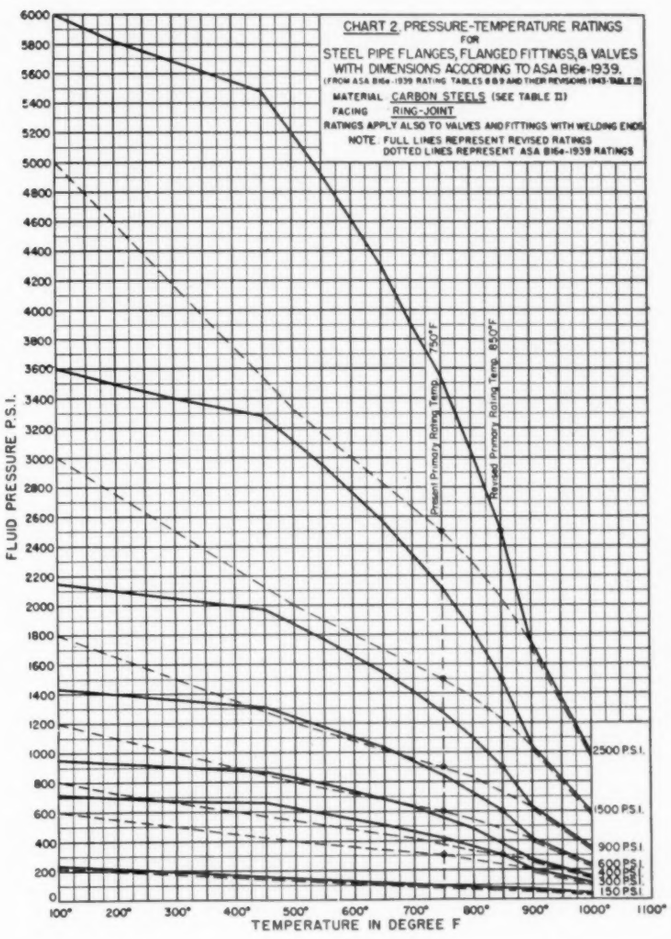
CHART 2. PRESSURE-TEMPERATURE RATINGS
FOR
STEEL PIPE FLANGES, FLANGED FITTINGS, & VALVES
WITH DIMENSIONS ACCORDING TO ASA B16e-1939.
(FROM ASA B16e-1939 RATING TABLES 6 & 9 AND THEIR REVISIONS 1943-TABLE II)
MATERIAL : CARBON STEELS (SEE TABLE II)
FACING : RING-JOINT
RATINGS APPLY ALSO TO VALVES AND FITTINGS WITH WELDING ENDS
NOTE: FULL LINES REPRESENT REVISED RATINGS
DOTTED LINES REPRESENT ASA B16e-1939 RATINGS
FLUID PRESSURE P.S.I.
TEMPERATURE IN DEGREE F
Present Primary Rating Temp. 750°F
Revised Primary Rating Temp. 850°F
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1500 P.S.I.
900 P.S.I.
600 P.S.I.
400 P.S.I.
300 P.S.I.
150 P.S.I.

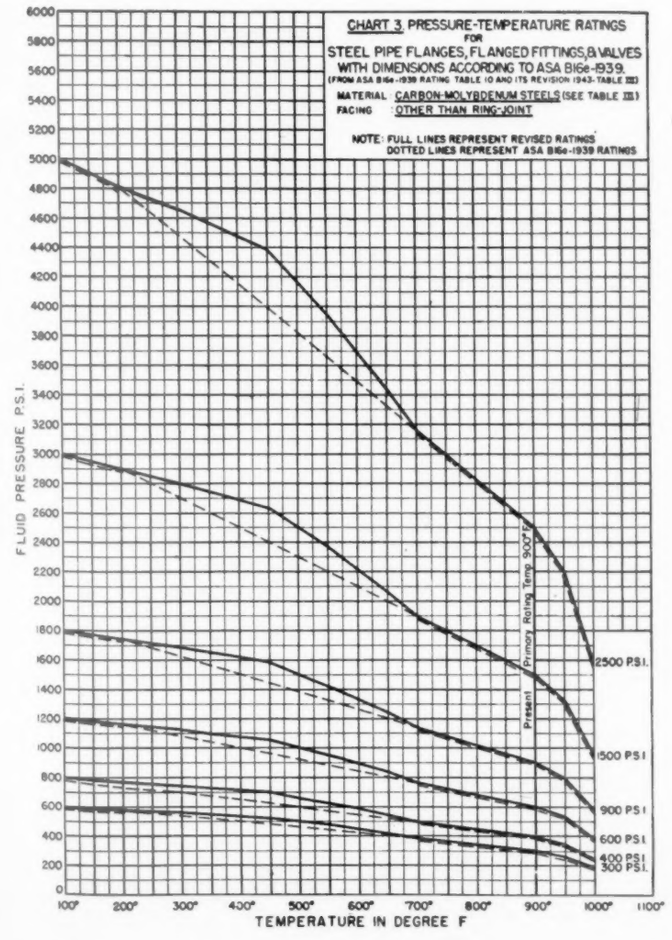
CHART 3. PRESSURE-TEMPERATURE RATINGS
FOR
STEEL PIPE FLANGES, FLANGED FITTINGS, & VALVES
WITH DIMENSIONS ACCORDING TO ASA B16e-1939.
(FROM ASA B16e-1939 RATING TABLE 10 AND ITS REVISION 1943-TABLE III)
MATERIAL : CARBON-MOLYBDENUM STEELS (SEE TABLE III)
FACING : OTHER THAN RING-JOINT
NOTE: FULL LINES REPRESENT REVISED RATINGS
DOTTED LINES REPRESENT ASA B16e-1939 RATINGS
FLUID PRESSURE P.S.I.
TEMPERATURE IN DEGREE F
Present Primary Rating Temp. 900°F
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1500 P.S.I.
900 P.S.I.
600 P.S.I.
400 P.S.I.
300 P.S.I.

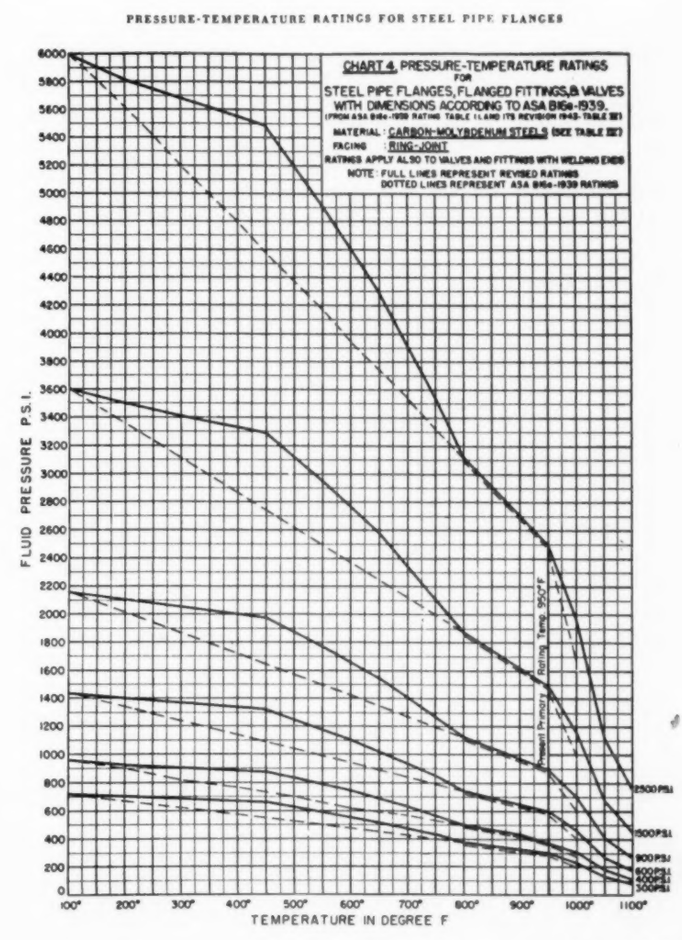
CHART 4. PRESSURE-TEMPERATURE RATINGS
FOR
STEEL PIPE FLANGES, FLANGED FITTINGS, & VALVES
WITH DIMENSIONS ACCORDING TO ASA B16e-1939.
(FROM ASA B16e-1939 RATING TABLE 11 AND ITS REVISION 1943-TABLE IV)
MATERIAL : CARBON-MOLYBDENUM STEELS (SEE TABLE IV)
FACING : RING-JOINT
RATINGS APPLY ALSO TO VALVES AND FITTINGS WITH WELDING ENDS
NOTE: FULL LINES REPRESENT REVISED RATINGS
DOTTED LINES REPRESENT ASA B16e-1939 RATINGS
FLUID PRESSURE P.S.I.
TEMPERATURE IN DEGREE F
Present Primary Rating Temp. 950°F
2500 P.S.I.
1500 P.S.I.
900 P.S.I.
600 P.S.I.
400 P.S.I.
300 P.S.I.

Research and Patents*

(The 1943 Perkin Medal Address)

By Robert E. Wilson**

Our American patent system stands in great danger of radical and shortsighted changes which will greatly affect its usefulness. These proposed changes are due largely to the public's misunderstanding, which has been brought about mainly by deliberate misrepresentations of the nature of the patent system, in many cases by men in high office. If the public is to come to a true understanding of the patent system and the part it has played in making possible the development of new inventions and great scientific industrial achievements in this country, it will be principally through efforts to enlighten the public on the part of chemists, engineers and others in industry who have seen and even participated in these achievements.

In the forefront among staunch advocates of the patent system should be the research workers, operating technologists and management in the petroleum industry, which is in itself a leading example of large and rapid development in processes and methods made possible under the present patent system. The accompanying article is a defense of our American patent system by one of the leading scientists of the petroleum industry, Robert E. Wilson, president of the Pan-American Petroleum and Transport Co. His own experience has given him unusual opportunity to view the practical workings of our patent system from all aspects. This includes 4 years as an independent inventor, with many patents sold or licensed, two years as an inventor in government service, some 13 years directing research and development for a large oil company and for the past 8 years he:d of another oil company which is on the royalty-paying rather than the royalty-collecting side of the fence. His recent service as the director of a corporation taken over by the Alein Property Custodian has also brought him in contact with problems involved in handling foreign-owned patents.

The fact that Dr. Wilson chose the subject of the American patent system for this particular address is significant. It was delivered on the occasion of the presentation to him of the Perkin Medal, awarded annually by a committee representing the leading chemical societies to a chemist in this country for outstanding achievement in this field of science. "However, no apology is necessary", said Dr. Wilson in introducing his subject, "for devoting my time to a matter which gravely threatens the whole future of industrial research and our national welfare."

The earlier portion of his address is omitted here, in which the speaker outlines the causes of the present misunderstanding of the patent system. Republished in full is the section which discusses the proposed reforms. All oil men should read it for a broader understanding of the changes in the patent system which have been suggested.

THE SPEAKER

Latest honor to come to Robert E. Wilson, prominent scientist of the petroleum industry, is the awarding of the Perkin Medal for 1943. This medal is given annually by the American Section of the Society of Chemical Industry for outstanding work in applied chemistry, the recipient being selected by a committee of representatives of leading chemical societies.

In addition to being distinguished in the oil industry, Dr. Wilson has been before the public through being advisor on petroleum matters to the government in the period of war preparation. He resigned as oil consultant for the Office of Production Management in July, 1941, to devote his entire time to his company's affairs.

Dr. Wilson left the chair of associate professor of chemical engineering at Massachusetts Institute of Technology in 1922 to direct research work for the Standard Oil Co. of Indiana. He has been president of Pan American Petroleum and Transport Co. since 1937.

Dr. Wilson

REGARDLESS of theory, the experience of this country during the past 150 years has demonstrated that the American patent system has been an outstanding success. It was based on a sound understanding of human nature, and its principles have no more been outmoded than has human nature been outmoded. It has stimulated and supported the natural inventive genius of our people, and has resulted in technical and industrial developments which have made us the envy of all other nations. I can speak from close personal knowledge of the stimulation afforded by the outstanding success of the Burton process and the related patent situation. It was unquestionably the major factor in stimulating research in our industry, first on competitive methods of cracking, and then on the myriad of new processes which have transformed the whole industry in recent years. Dr. Burton in 1912 was one of probably not more than a dozen scientists in this country engaged in petroleum research. In 1922 when I entered the industry there were about 250, and in 1942 there were more than 7000 such research workers in our field.

It might be argued that other nations also have patent systems without getting such outstanding results, but the American patent system has real advantages over most of the foreign systems in several respects. For example, it provides that the first inventor, and not the first one who files his application in the Patent Office, is entitled to the patent. This encourages a man to take adequate time to appraise his invention, work out the details, and even discuss it with others, without jeopardizing his position as the first inventor provided he keeps adequate records.

In the second place, American patents are not subjected to heavy taxes or compulsory licensing provisions which greatly decrease their practical value, especially to an ordinary independent inventor during the early years when his financial resources are likely to be inadequate.

Furthermore, the fact that sound patents are generally respected by the responsible business interests of this country increases the market for, and the value of, a patent in contradistinction to the practices in many foreign countries. As John Anderson, an independent inventor of note, has well said:

"People seldom plant gardens where thieves abound and police protection is inadequate. Pirates are everywhere and inventors will not continue to invent, nor will small investors support their inventions, if patent rights are not sympathetically protected."

Value of Cross-Licensing Agreements. Another object of misinformed criticism is the simple cross-licensing agreement between parties actively engaged in similar lines of research. Such research generally results in

*A portion of an address under this title delivered by Dr. Wilson when he was awarded the Perkin Medal of the American Section of the Society of Chemical Industry in New York, Jan. 8, 1943.

**President Pan American Petroleum and Transport Co.

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many Patent Office interferences and overlapping patents which would prevent any party from using the best process in sight. Under such circumstances there has been an increasing tendency to avoid the expense and delay attendant upon interference and infringement litigation by arbitrating the interferences and exchanging cross licenses as to both past and future developments in a given field, usually on a royalty-free basis. Such an agreement generally involves provisions for the licensing of others upon reasonable terms and a division of royalties based upon the best estimate of the parties as to the relative value of their respective positions. Usually each party also agrees to conduct further research in the field in question and is left free to license his own patents on such terms as he sees fit.

Promotes New Developments

In spite of recent attempts to arouse opposition to such arrangements labeling them all "patent pools" without analyzing their provisions, it seems clear that the ordinary cross-licensing arrangement between companies actively engaged in research is very much in the public interest, since it facilitates and stimulates research, prevents unnecessary duplication, removes obstacles to prompt commercial development, and avoids wasteful litigation. The free and prompt exchange of ideas and information between rival laboratories is a tremendous accelerator of new developments. Such cross-licensing arrangements also make available to an outside licensee all the necessary patents and, what is frequently more important, the combined experience of several companies so that he can select and operate the process best suited to his needs without having to acquire licenses and information from several different sources. The only party who could reasonably complain against such an arrangement is the individual or company which hopes to use with impunity the new process while the owners of the patents fritter away the life of their patents in lengthy and often suicidal litigation with one another.

Since cross-licensing agreements of this type tend to promote not only research and invention, but the prompt commercial application of the inventions, the question might be raised as to why free cross-licensing agreements covering entire industries would not be still better in this respect. The main difficulty of such arrangements is that they run up against human nature; when some individuals or companies realize that their competitors will have the same rights they have to anything new which they may develop, they frequently decide to leave most of the expense of research and development to the other fellow and hope for a free ride for themselves. Other companies which, as a matter of principle, continue their research, sooner or later become irritated when the fruits of their research are appropriated by others who have contributed nothing. Such industry-wide pools also remove the main incentive of any company to pioneer radical new developments; they have everything to lose and little to gain by such action which will quickly be copied by everyone if it proves popular.

While it is true that cross-licensing agreements have occasionally been used as a screen for an attempt to divide the market or to control unpatented devices, such arrangements are clearly under the prohibition of the antitrust laws and are practically obsolete today, thanks in part to the vigorous activity of the antitrust division. Accordingly there seems to be no reason to legislate against the ordinary and desirable type of cross-licensing agreement which I have described. If a few of the larger companies in a major industry made a cross-licensing arrangement covering every branch of their business without regard to their respective patent and research positions and excluded others from such an arrangement, it might be open to criticism; but where, as in the petroleum industry, each new important field of development generally becomes the basis for one or more cross-licensing arrangements with different participants, depending upon who has pioneered in the new field, and with the arrangement open to newcomers who can contribute substantial patent assets, it is an altogether healthy thing. Certainly it is an efficient method of getting new developments into prompt production without awaiting the result of lengthy patent litigation.

While I do feel that our patent system is basically sound and vital to the future of research, this does not mean that patent laws do not from time to time need revision to meet changing conditions and avoid possible abuses.

Changes Suggested

The Commissioner of Patents not long ago suggested a number of administrative changes in the patent law which had general approval of those most concerned with patents; most of these have already been adopted. Others have vigorously urged more drastic suggestions which have not received such general support; it is to these that I would particularly call your attention.

Compulsory Licensing. At the head of the list of proposed drastic changes in the patent system are various types of provisions for compulsory licensing. The argument generally used in favor of such provisions is that many patents are used to suppress inventions. If that were actually the case, there would admittedly be argument for some form of compulsory licensing but, to the best of my knowledge, none of the extensive hearings on patent matters has dug up a single authentic case of this kind. In all my work in dealing with patents and inventors or trying to get licenses, I have never found a patent owner who took that attitude. Frank Jewett whose experience in this field is unexcelled recently wrote:

"Despite the fact that I have made diligent inquiry over the years, I have never been able to locate a suppressed patent nor have I ever found anyone who could cite an authentic case of suppression. . . The plain truth of the matter is that a large part of unused patents are worthless things which the inventors insisted on patenting and on which the Patent Office had to issue patents because the ideas presented were technically new and novel—the Patent Office does not pass judgment on the utility of the patents it grants. They are not and never were anything anybody would use, in the face of better things, even if you gave the patents to him.

"Then there is the great group of unused patents which, although they may have had original merit, were rendered obsolete by subsequent inventions. Except for patents on really fundamental new ideas every new patent tends to kill the value of those which preceded it. . . The only possible way for a business at all dependent on live patents to avoid extermination in the competitive struggle is to keep eternally at the process of replacing its dead and dying patents by new and better ones and that mainly by its own creative effort."

Recent headlines about the suppression of patents on devices needed for war are nothing more than imagination, because legislation has been in effect since the last war providing in effect for compulsory licensing of any patent needed by the government in time of war. Accordingly the whole matter should be dissociated from the war and be viewed more calmly from a long-range point of view.

The greatest objection to compulsory licensing in normal times is that it largely cancels the very reward the inventor was supposed to receive. It also interferes with the incentive of the patent owner or licensee to make a large investment in a new development if he is faced with the possibility that he may at any time be forced to give a competitor a license on terms which are unpredictable. If there were some way in which one could properly determine a fair royalty and other reasonable terms in the event of compulsory licensing, it would overcome much of the objection to such licensing, but inventions are so widely different in character and in the investment required to develop them that it is impossible to set up any general standards as to the proper terms for a license.

The old American art of horse trading between the patent owner and the man who wants a license is often time consuming and annoying, but it is probably the best way to arrive at the fair value of a license, and it has the further advantage of generally being open to readjustment from time to time as conditions change.

Arbitration Difficult

It is sometimes proposed that the value of the compulsory license be arbitrated. While the principle of arbitration appeals to everyone as reasonable, the intangible factors make arbitration peculiarly difficult in the case of granting a patent license, because both the terms and the royalty rate are open to so much trading back and forth, with back licenses under other patents often constituting part

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In refineries, in spite of the vital war job they are doing, the scarcity of corrosion-resistant alloy metals is bound to affect heat exchanger maintenance.

Salty crudes are a recognized cause of corrosion and plugging in heat exchangers. Salt hazards not only shorten exchanger tube life and increase necessary replacements; they also lead to inferior products and retarded throughput rates.

Formerly, one answer to salt trouble in exchangers was frequent maintenance work. Now, such procedure is, as always, costly, with the scarcity of quality alloy metals increasing the impracticability of a maintenance plan based on frequent replacements.

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DESALTING **DEHYDRATING**

of the consideration, that it is even harder than the case I previously mentioned of determining the value of a single patent. Furthermore, the patent owner is at a peculiar disadvantage in such an arbitration in that he would be compelled to grant a license on the terms set by the arbitration, whereas if the prospective licensee who requested the arbitration did not like the terms, he could always find some reason for not going ahead with substantial use of the patent; therefore arbitration in such a case is really a one-sided proceeding, binding only on the patent owner.

Compulsory licensing would militate most seriously against individuals and smaller companies who would have to go outside to secure financing to develop and exploit their patented development. Venture capital cannot be attracted into new and hazardous fields without the prospect of unusual returns, which compulsory licensing would prevent.

Proposed Prohibition of Restrictions in Licenses. While the granting of a patent monopoly seems virtually essential to afford an adequate incentive for research and invention which is every year becoming more expensive and difficult, it is nevertheless equally true that once the invention has been disclosed and the patent granted, it is thereafter in the public interest, and usually in the inventor's interest, to have licenses granted to as many people as can make effective use of the invention.

Any license, however restricted, is in essence a voluntary concession of part of the owner's rights under his original patent monopoly. In disposing of part of his monopoly, the patent owner naturally must make clear just what he is giving away and what he is retaining for himself, but such limitations in licenses have recently been under heavy attack as though they were fundamentally undesirable, and legislation forbidding almost any such limitations has been proposed. Actually, the net effect of drastic provisions against restrictions in licenses is likely to be opposite of that intended.

The practical aspect of this can possibly be best illustrated by again referring to the analogy of the ownership of land. Suppose a man owning a tract of land is asked to grant a right-of-way for a road across his land. He would probably be quite willing to grant such a right-of-way provided he received reasonable compensation and could protect his own rights in the remainder of the land by providing that the man who acquired the right-of-way must keep a certain distance from his house, construct and maintain fences and agree not to trespass on the remainder of the land.

These provisions are restrictive as to rights and duties of the man who acquires the right-of-way, but the important thing is that he does not lose any rights he ever had; he simply agrees to definite limitations on the new rights which he acquires.

Now if we pass a law saying that all grants of right-of-way must be unrestricted and without limitation, it is certain that the land owner will be much less willing to grant rights-of-way; or if he does, he will charge much more for them. Exactly these considerations apply in the case of many of the proposed prohibitions against restrictions in licenses. It should be made as easy as possible for a man to chip away his monopoly gradually, however small the individual pieces.

One set of proposals put forward last spring in Senate Bill 2491 would specifically outlaw any restrictions in licenses as to (1) price, (2) quantity permitted to be manufactured, (3) geographical limitations, and (4) limitations as to the use to be made of patents.

As to the restrictions on the price or quantity of patented articles to be produced under a license, the modern trend in licensing, at least in the industries with which I am most familiar, is away from all such restrictions, and I cannot argue strongly against the prohibition of such restrictions. However, even such prohibitions would tend to discourage licensing or force up royalty rates in certain cases where a patent owner feels that such restrictions on first sale are necessary for his self-preservation.

Geographical Restrictions

The matter of prohibiting geographical restrictions is much more serious. For example, take a man who is manufacturing an article in the East or Middle-West on which the freight to the Pacific Coast is large. He might be approached by a Pacific Coast manufacturer who wanted a license, and since the patent owner could not readily fill this market himself, he would be glad to grant a license if it could be limited to manufacturing on the Pacific Coast.

If, on the other hand, geographical restrictions were prohibited so that he could not grant a license without throwing open the whole world to his licensee, he would probably decide to give no license at all, and the Pacific Coast would continue to suffer from the lack of a convenient source of supply.

Even more unfortunate would be the practical effect of the proposed prohibition of any limitations as to the use to which a licensee might make of a patented process or apparatus. This entirely overlooks the way most licenses are desired and granted by most companies operating in the process industries. Suppose X oil company owns a patent on a process capable of being used to make products of high value, such as 100 octane gasoline, as well as products of relatively low value such as kerosine. If Y company wanted to take a license on this process to make kerosine, it would undoubtedly say that it could afford to pay only a small royalty under these conditions, and X company would probably agree to this, provided it used the process only for making kerosine.

If, however, Y company later wanted to use the process for making 100 octane gasoline or some other product of high value, such a royalty would be unreasonably low. Since it would be impossible to determine in advance a fair royalty for every possible use to which the user might want to put the process, it would best suit the needs of both X and Y companies to set a royalty rate for the use or uses definitely contemplated and limit the license to such uses. If X company were permitted to give only an unlimited license for unknown future uses, it might well decide not to grant any license at the low rates appropriate for making kerosine.

Furthermore, while Y company would be primarily interested in getting a license on only one or two specific patents, it would undoubtedly want, and expect to get, drawings and designs for complete equipment to carry out this process and in the design of that equipment there might be half a dozen minor patented devices which neither X or Y might have in mind. If Y were well advised, it would insist that it have the right to use any of X's patents in carrying out the specific process, and X might well agree to this "throwing in" of all incidental patents, provided such uses were limited to the process under discussion; but it would certainly not throw in all of his patents for use in any process which might come along merely for the payment of a small royalty based on a kerosine operation. The great bulk of the process licenses granted in our industry do not attempt to enumerate all the patents and applications which might be useful in a given process but give a blanket license under any of the patent owner's present or future patents for the defined process. Such broad licensing of all the licensor's patents for the desired use is certainly in the public interest but would be made impossible by the proposed type of restriction.

Shortening of the Patent's Life. One abuse which has been clearly evident in a few cases is the practice of deliberately and excessively prolonging the period of argument back and forth in the Patent Office so that a patent is not issued until many years after the application, in order to get the benefit of a later effective period of life. For this reason one of the suggested reforms which would keep the life of the patent at not more than 17 years but also limit the expiration date to not more than 20 years after the application was filed seems to have real merit. Even the 17-year life is open to question in view of the accelerated industrial tempo which, in general, makes it possible to get a new invention into operation much more promptly than was the case when the 17-year term was originally set. On the other hand, it is getting more and more expensive and difficult to make and develop new inventions as the frontiers of science are pushed farther and farther afield, and there should be some offsetting increase in incentive. Seventeen years seems a long period when we are in the midst of a new development, but it is a short time in the life of a nation or an industry. Certainly no one today begrudges James Watt his monopoly on the steam engine from 1769 to 1794, or Bell his telephone from 1876 to 1893.

Greater Care in Granting Patents. It must be conceded that a large number of patents issued by our Patent Office relate to minor or petty details of routine improvement and do not cover true inventions. While these

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• The greatest air force the world has ever seen is in the making. To keep the vast fleet of American planes flying and fighting there is a tremendous demand for 100 octane gasoline.

Out of this urgent need has come a new catalytic alkylation process using anhydrous HF—a remarkably successful process that is doing much to increase the output of all-important high octane fuel.

Anhydrous HF was first produced in commercial quantities at the Penn Salt plant at Easton, Pa. (formerly the Sterling Products Co.).

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weak patents are being consistently knocked down by the courts, they are often a source of harassment, confusion, and expense. There appears to be too low a standard of patentability in the Patent Office, and in recent times too awesomely high a standard of patentability in the courts. Although the Patent Office is required to resolve its doubts in favor of the inventor, it seems that the Patent Office has in general been too liberal.

The Patent Office is not alone at fault in this connection. It is subjected by attorneys and applicants to strong and relentless pressure to issue some kind of a patent even though the applicant or attorney realizes that it may be of doubtful validity. This type of patent is sometimes called an "insurance" patent because its main purpose is to prevent someone else from being granted a patent later on the same thing.

The character of patents probably would also be improved simply by raising the salary standards in the Patent Office. The present salary situation is such that there is little incentive for the patent examiner to regard service in the Patent Office as a lifetime career, with the result that the Patent Office functions to a considerable degree as a training school for patent attorneys.

There is also room for improvement in the information available to examiners in making searches for patentable novelty. Much practical knowledge and information from the industry should be but is not available in the Patent Office. One constructive move to help remedy this situation would be to establish a procedure whereby the examiners, at least those of senior rank, would have frequent personal contact with development and manufacturing activities in the particular fields which they are examining.

Effect on Research of Drastic Weakening Of Our Patent System

For an authoritive and considered statement as to the relation of patents to research, one would logically go to the National Research Council. In their December, 1940, report to the National Resources Planning Board they have said:

"It is generally recognized, however, that patents play an important part in the motivation of research, and no changes in the patent system should be made without most careful consideration of possible effects on the welfare of industrial research."

Emasculation of our patent system is bound to discourage much industrial research which has grown so amazingly in recent years until it employed about 70,000 research workers in 1940. However, the effect on the amount of research done will vary greatly with the industry and particularly with the size of the company, and in a direction which would seem to be socially undesirable as it would in the long run weaken the competitive position of the smaller companies. Let us consider the relative effect on companies of various sizes.

Little Effect on Large Companies. A drastic weakening of our patent system will least affect the research policies of the large companies. Such companies can readily afford to carry on research programs covering their principal fields of activity solely for the purpose of maintaining their competitive position and keeping down their manufacturing costs.

They regard royalties mainly as incidental by-products of their research, and their main interest in patents is to help them secure maximum operating freedom by virtue of exchanges of licenses. Obviously, if they find it expedient not to depend on patents, such companies will not stop their research but will tend to keep their "know how" largely to themselves.

Major Effect on Medium and Small Companies. The effect of emasculation of our patent system on the research activities of medium and small companies will be much more severe. Such companies must have some research organization if they are to keep anywhere near abreast of competition, but their laboratories cannot possibly do original research in all their fields of activity. In general they concentrate mainly on operating problems and the application of various patented processes to their own needs.

In either type of work they frequently run across some new idea which seems to have merit; and even though their own activities would not justify the cost of a thorough investigation, as long as they have the prospect of patent protection and substantial royalty income, they can and do exploit such ideas, at least through the phase of laboratory development. Many small laboratories have more than financed all their research activities by one or two important inventions.

Also, when they come to the point of needing to undertake large scale development, which in our industry frequently costs several hundred thousand or even a few million dollars, such companies can usually, by virtue of patent protection, interest other companies in joining with them and sharing such development costs. Several small companies in our industry have attained a position of preeminence in certain fields by just such methods, but without the incentive and protection of a sound patent system the ideas would probably never have been developed. As Patent Commissioner Coe has said: "Speculative capital will not back new inventions without patent protection."

Another factor which would tend to reduce research in such companies would be that, without our patent and licensing system, the companies which develop major new processes would not be giving out information and trying to sell licenses, and hence the smaller companies would not be able to study promptly the application of these new processes to their own needs, so the whole process of development in industry would be retarded.

Elimination of Research and Licensing Companies. In addition to the research conducted by operating companies, in many industries one or more nonoperating companies have maintained research and development programs which have resulted in important processes. Outstanding among these in the petroleum industry is the Universal Oil Products Co. which first developed the Dubbs cracking process.

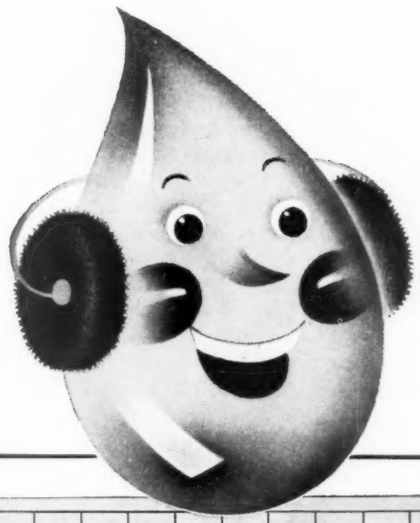
This company has for over 20 years maintained a large research staff and has made many other outstanding contributions to the refining of petroleum and to the chemical field as well. In the past 20 years it has spent approximately $25,000,000 for research and process development, more recently at the rate of about $2,000,000 annually. The income of this company is derived entirely from the licensing of its patented processes, and the major portion of its royalty income has been used for continuing research and development. The income derived from royalties on thermal cracking was largely used to study and develop some of the present catalytic processes which are so vital in the war effort, including catalytic cracking, alkylation, isomerization and dehydrogenation for aviation gasoline, and other processes for the production of components of synthetic rubber, etc. Universal Oil Products also maintains a group of skilled technicians who for years have advised and assisted its smaller refiner licensees to maintain operations on the most efficient basis. The weakening of our patent system will automatically result in the disappearance of these research, development, and licensing companies which have proved so important, particularly to the smaller operating companies.

Effect on University and Foundation Laboratories. A generation ago most research workers in the medical field and many of those in our universities felt that it was not quite ethical to patent their discoveries, particularly in matters relating to public health. During the past 20 years, however, there has been a growing recognition of three facts:

(1) Failure to patent is more likely to delay than to encourage the development and marketing of new products, especially if any substantial investment or advertising is required to get them started.

(2) Failure to patent leaves new remedies open to widespread abuse by unethical manufacturers and promoters, whereas patenting permits a control of quality and marketing practices which is highly desirable in the case of many new drugs.

(3) Failure to patent simply throws away a large potential income from those who benefit from new discoveries, which income

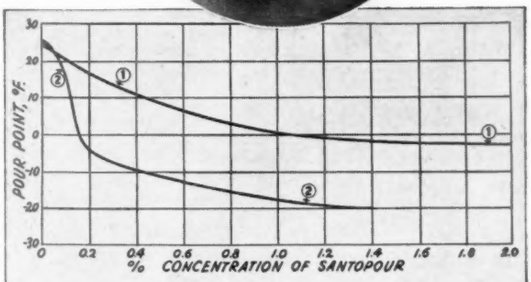


Santopour...

Have you tried this MODERN pour depressant in your lubricants?

The addition of a small amount of Santopour to most automotive crank case oils will give:

1. ***Easier engine starting* at low temperatures.**
2. ***Improved pumpability* of the cold oil, resulting in *decreased engine wear.***



HOW SANTOPOUR LOWERS POUR POINT

These curves show the effect of Santopour on two Pennsylvania base oils.

CURVE 1: Pennsylvania bright stock, conventionally refined.

CURVE 2: Pennsylvania bright stock, solvent refined.

The effectiveness of Santopour depends first upon the amount of readily crystallizable wax contained in the oil, and secondly upon the number of other types of foreign material that may already be present.

TYPICAL INSPECTION TEST—SANTOPOUR

Gravity, °A. P. I.	26.7
Flash, °F.	485.
Pour, °F.	10.
Viscosity, S. U. at 210°F.	156.4
Carbon residue	1.4
Color, NPA (85 and 15)	6.+
Neutralization number	0.02

FURTHER, many refiners and blenders are finding it possible to realize marked savings by using higher pour-point stocks and adding Santopour to produce low pour-point marketable products.

The graph at the left shows how effectively small amounts of Santopour lower the pour point of Pennsylvania bright stock lubricants. A simple laboratory test of Santopour in your particular oils will show exactly how little is required to give *your* lubricants any specific pour point.

Santopour is blended with petroleum oils in exactly the same manner as an ordinary oil except that blending temperatures should be elevated to 140° to 150°F. Its addition does not change any property of the oil except to lower its pour point.

Determine for yourself the potency of Santopour with your particular oils. Simply mail the coupon below for full details and a sample large enough for thorough laboratory tests. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, St. Louis, Missouri.

"E" FOR EXCELLENCE—the Army-Navy "E" burgee, "representing recognition by the Army and the Navy of especially meritorious production of war materials" has been awarded to Monsanto and and replaces the Navy "E" first awarded Monsanto, Dec. 31, 1941.

MONSANTO CHEMICALS

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, 1702 S. Second St., St. Louis, Missouri

Please send me a sample of Santopour for laboratory test with our lubricating oils.

*Name*_____

*Title*_____

*Firm*_____

*Address*_____

*City*_____

might better be collected and used to promote further research in related fields.

Growing appreciation of these three facts has largely changed the attitude toward patents of the workers in these fields, so that patenting is now the usual practice. Partly due to the outstanding example of the Wisconsin Alumni Research Foundation, millions of dollars a year are today being devoted to pure research in medical and other lines from royalties obtained from the inventions of earlier workers, generally in the same organization.

This is a sound and socially desirable method of financing research work which would be lost if the value of patents were to be greatly reduced.

Back to Dark Ages of Secret Processes. Probably the most serious effect that emasculation of our patent system would have on the future of research would be to encourage the use of secret processes. This would be highly unfortunate, since one of the principal factors in the rapid advance of science and technology in the past 30 years has been the practical elimination of the secret process in favor of full disclosure and patenting as the preferable method of protecting one's rights and interests in his invention.

If we take away a large part of the reward for disclosure, the tendency to revert to the dark ages of secret processes will be inescapable. The loss to our country would not be merely that due to the absence of competitive use of new processes, but even more in the slowing down of the exchange of basic information and new ideas.

Intercompany research conferences and reports on new lines of development would practically cease, and early publication of industrial research work would seldom be permitted. Industrial espionage would rear its ugly head, and efforts to prevent it would force the elimination of the open-door policy of most of our industrial laboratories. As Kettering has said, "when you lock the research laboratory door you always lock out a great deal more than you lock in", but serious weakening of our patent system would inevitably result in just such a situation. Modern industry based on applied science is a great cooperative affair which cannot thrive in a world ruled by secrecy.

Another unfortunate result of secret processes would be that a small company would no longer be able, as a prospective licensee, to get full information and detailed plans on competitive new processes. Even though the owners of the secret processes were willing to sell the know-how, they could not make prior disclosure of their processes for comparison with other, and the small company would either have to buy a "pig in a poke" or do without.

Even the workers in pure science who might discover some new principle would probably hesitate to publish it until they could work out some of the practical applications for sale on a secret process basis, because once a new discovery was published it would largely lose its value. Even though the attempt at secrecy might usually fail within a few years, the cumulative effect of the loss of time between successive improvements would tremendously retard our progress.

Under present conditions new discoveries are frequently published long before the patent is actually issued, and the effect on the whole tempo of industrial progress is very large because so little time elapses between the discovery and the general availability of the information to stimulate other researches in a variety of fields not even dreamed of by the original discoverer.

Loss of Information from Abroad. We must also not overlook the effect of a drastic weakening of our patent system on our future ability to get information from abroad. Foreign manufacturing conditions are usually better adapted to protecting the secrecy of processes than those in this country, and it is only the liberality of our patent system and the existence of a real market for worth while patents that have led most foreign patentees to make early application for a patent in this country.

No country has, or can expect to have, anything like a monopoly on brains, and anything which will discourage our receiving prompt information regarding new foreign developments will be another serious bar to industrial and scientific progress. Even though some foreign inventors might still apply for patents in their own countries so that some information would eventually become available, it would not be possible for us to secure the detailed plans, specifications, and know-how which can usually be obtained when it is possible to negotiate for a patent or a license.

This know-how is particularly necessary on foreign patents because their background of language and industrial technique is frequently not well understood in this country.

To indicate a little of the extent to which our ability to meet war demands has arisen out of information obtained from our principal enemy, Germany, thanks to the enterprise of American companies and the existence of our patent system, I might cite the following brief summary of a few important items in this category from an article by Lawrence Langner in a recent *Atlantic Monthly*.

In quoting this list I do not mean to imply that similar or alternative processes were not being, or would not have been, developed in this country under the stress of war needs. The important thing is that we obtained early information which permitted pre-war industrial development of the processes and products which have proved so important to the war effort. Langner's list is as follows:

Tetracene, a percussion explosive. Information obtained from Germany by Remington Arms Co., a subsidiary of the Du Pont Co.

Optical glass and instruments. Information obtained from Germany by Bausch & Lomb Co.

Plexiglas, a plastic glass used for airplanes. Information obtained from Germany by Rohm & Haas Co.

Carbology, a tungsten steel alloy important for cutting tools. Information obtained from Germany by General Electric Co.

Buna rubber. Information obtained from Germany by Standard Oil Co. of New Jersey.

Magnesium. Information about new processes obtained from Germany by Aluminum Co. of America and others.

Atabrine, a vitally needed substitute for quinine. Information obtained from Germany by Winthrop Chemical Co.

100-octane aviation gasoline. Information on which the principal American process is based obtained from Germany by Standard Oil Co. of New Jersey.

Synthetic toluene for TNT. Information on which the principal American process is based obtained from Germany by Standard Oil Co. of New Jersey.

This impressive list of American weapons forged from German research certainly belies frequent loose statements that our leading industrialists were serving as blind tools for Hitler when they acquired their patent licenses.

Conclusion

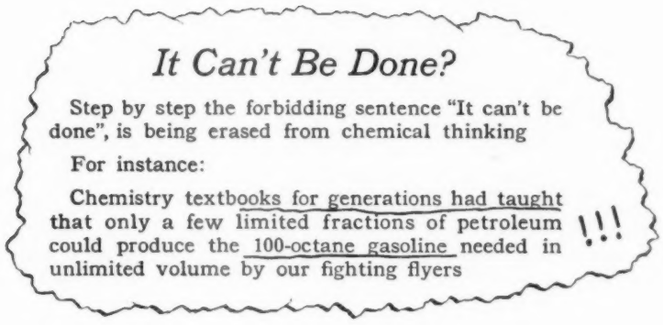
In conclusion I hope that what I have said will convince both this audience and later readers that our patent system is in real jeopardy, and that this jeopardy is due to public misunderstanding which, in turn, is largely due to deliberate misrepresentations as to the nature of the patent monopoly and the part which patents play in encouraging inventions and their prompt disclosure to the public.

The inevitable alternative of secrecy would tremendously retard the progress of both science and industry in this country. Under these circumstances it is surely incumbent upon every scientist to take his share of the job of educating the public and our legislators as to the truth about our patent system.

In many ways the most encouraging aspect of the Washington outlook was the appointment by the President of a Patents Planning Commission under the chairmanship of Charles F. Kettering. This committee has been expressly directed by the President to conduct a comprehensive survey and study of the American patent system and to make suggestions for its permanent improvement. Rather than being stampeded into making drastic patchwork changes as urged by some of our theorists and nonresearch industrialists, we should certainly await with confidence the completion of the studies of this committee. I think we can reasonably anticipate a report as sound and important to our industrial picture as the recent Baruch report on the rubber problem.

If such a report is given the weight it deserves, I believe we can look forward with confidence to the future of research and invention in this country, which is our greatest hope for prompt postwar readjustment of our economy.

Were it my job as supersaboteur to destroy America's future greatness, I can think of no more effective way than to destroy our patent system. The tragedy is that if we permit impractical theorists and faddists to distort the facts and hypnotize our nation into this act of hara-kiri all of us will suffer and yet no adequate punishment can be meted out to those really responsible. Let us not by our inaction have any share in such a terrible responsibility.


It Can't Be Done?
Step by step the forbidding sentence "It can't be done", is being erased from chemical thinking
For instance:
Chemistry textbooks for generations had taught that only a few limited fractions of petroleum could produce the 100-octane gasoline needed in unlimited volume by our fighting flyers
!!!

Thank you, professor

The above wordless comment on a Universal ad was recently sent in by a widely known professor of chemistry We appreciate this tactful correction

What the paragraph should have said is that chemistry textbooks for generations had taught that paraffin hydrocarbons are inert—not readily reactive That was the generally held belief

And that is the belief exploded by U. O. P. research men

They discovered catalysts and developed processes that have made the paraffins react in lively fashion with other hydrocarbons to produce the constituents of 100-octane gasoline, thereby greatly increasing the potential supply of this vital fighting motor fuel

It's lucky for our fighting men—for all of us—that Universal research men did not stop at the barrier marked "It can't be done"

Thank you, professor

OIL IS AMMUNITION—USE IT WISELY CARE FOR YOUR CAR FOR YOUR COUNTRY

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

THE REFINERS INSTITUTE OF PETROLEUM TECHNOLOGY

Joint Research Program of Oil and Automotive Industries Now Devoted to War Problems*

Over the past 21 years, the petroleum and automotive industries, without any fanfares of publicity, have built up an organization for effective and economical joint research which is an outstanding example of the joining of two large industries to overcome technical difficulties. The late Henry L. Doherty, head of the Cities Service oil and gas and public utility enterprises, together with an outstanding automotive engineer of his time, is credited with first having conceived the idea of this joint research.

Fortunately for the nation, embarked on a war in which equipment powered by internal combustion engines plays the decisive role, this joint research organization is well established and functioning. It is thus able to serve as the means for directing the research facilities of the two industries on the fuel and lubrication problems arising in the operation of motored equipment in global military campaigns. The Cooperative Research Council of the two industries and how its activities are being devoted to the nation's war effort is described in this paper by the manager and secretary of the council.

By C. B. Veal**

C. B. Veal, manager and secretary, Cooperative Research Council, of the petroleum and automotive industries. He was S.A.E. research manager, and secretary of the Cooperative Fuel Research Committee for 16 years prior to his present appointment

THIS year (1942) the petroleum and automotive industries signalize the 21st anniversary of their joint research program by enlarging its sphere, revising its methods and changing its name.

The Cooperative Fuel Research program, started in 1921, grew from a project with a single immediate aim, conducted by three or four men at the Bureau of Standards, to an organization of 80 working groups with a total membership of more than a thousand actively interested technical specialists, carrying out its expanded research in 90 participating laboratories.

Impelled by this growth, the Cooperative Fuel Research in 1937 studied and reconstituted its organization, a prelude to the establishment of the Cooperative Research Council. The Cooperative Fuel Research Steering Committee, as it was organized in 1921, had no permanent chairman, nor any prescribed rules of procedure. It evolved suitable methods for dealing with each new research topic. Young and rapidly enlarging in an untried field, it utilized its freedom from restrictive organization formulas to expand flexibly in the directions indicated by current necessities. Passing beyond the tentative stage, with its bulk threatening unwieldiness, it looked for a more definite organization. In 1937, procedures that had passed the test of practice were codified, and a framework of committees, projects, and working groups was set up.

The next logical step was to apply these methods in other fields in which both industries have a common interest. Lubrication was the most outstanding and the most urgent, since lubrication then required studies characteristic of Cooperative Fuel Research—intensive cooperative effort devoted to current practical problems.

This substantial expansion of the joint research, added to its already notable growth, called for a re-examination of the relationship of the two industries toward it. According to the original understanding, since adhered to, the automotive industry, through the National Automobile Chamber of Commerce, later the Automobile Manufacturers Assn. and the petroleum industry, through the American Petroleum Institute, were to bear an equal share of the financial burden. The Society of Automotive Engineers was to maintain the secretariat, as part of the functions of its Research Department. The National Bureau of Standards expected to contribute in services an amount at least equal to the combined contributions of the National Advisory Committee for Aeronautics and the API.

Separate Organization Established

The scope and importance of the joint undertaking now justified its embodiment in an entirely separate organization. It was no longer to function in only one section of the overlapping fields of interest of the petroleum and automotive industries; it was to centralize, correlate, and promote research throughout the entire field. Furthermore, the joint research, vested in a separate body, would have the clarity and definiteness of form advantageous in dealing with other organizations, such as government bureaus, the Army, and the Navy. This consideration was particularly cogent, since the defense activities of 1940 and 1941 and the direct war effort later brought the armed services more closely and more continuously into contact with the joint research.

A corollary of a separate organization was a separate secretariat. Performing the secretarial functions had entailed for the S.A.E. greater expense than that borne by any other single contributor, a burden which, because of other increased demands, it felt heavily. An illustration of the unforeseeable increase in the volume of secretarial work is the production of minutes of committee meetings. A year's activity of the Cooperative Fuel Research Committee, in its early stages, comprised three or four meetings of its 20 or so members, and about 50 pages of mimeograph material. In 1941, CFR committees, with a total membership of 1050, held 63 meetings. In recording and circularizing minutes, 1840 stencils were cut and 115,920 page-copies mimeographed.

Late in 1941 a special committee of the S.A.E. was appointed to develop ways and means of transferring a part of the cost of the secretariat directly to industry. This group, meeting with a similar committee of the A.P.I., formulated a proposal promptly approved by both of the parent organizations. A Cooperative Research Council was to be created, equally representing and supported by the American Petroleum Institute and the Society of Automotive Engineers, and a separate secretariat was to be established. The Cooperative Research Council held its organization meeting April 13, 1942, and the new secretariat commenced functioning from its office in Rockefeller Plaza, New York, on May 1.

CRC Purpose and Organization

In its own words, the Cooperative Research Council proposes "to direct cooperative research in developing the best combinations of fuels, lubricants, and equipment powered

*Principal portion of a paper entitled "Cooperative Research Comes of Age", delivered before the War Engineering Production Meeting of the Society of Automotive Engineers, Detroit, Jan. 14, 1943.

**Manager and Secretary, Cooperative Research Council of the petroleum and automotive industries.

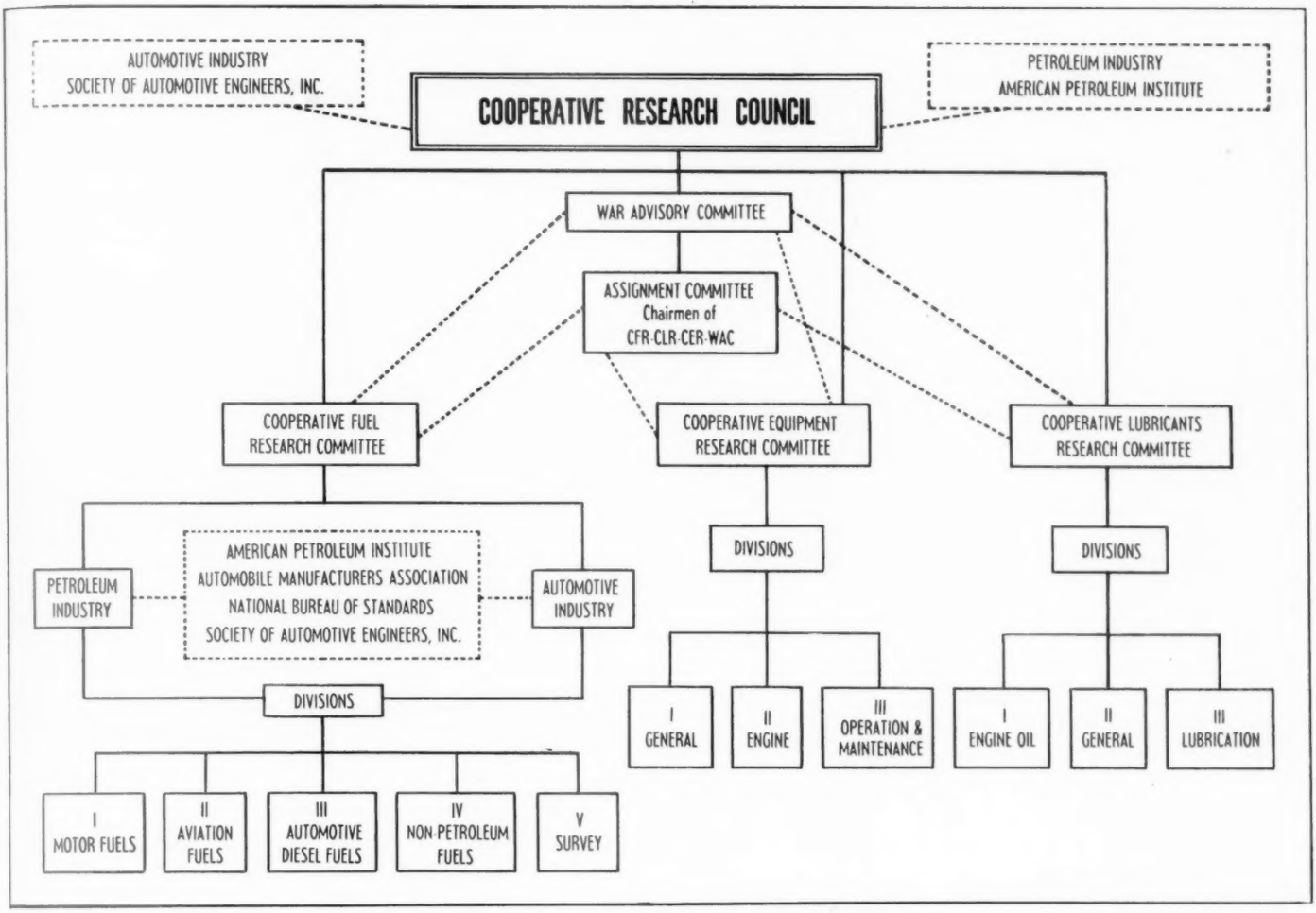


Fig. 1—Organization of committees and divisions of the Cooperative Research Council of the petroleum and automotive industries

by internal-combustion engines." It has the following self-imposed limitations: "Standardization of methods of test, specifications, and classifications shall not be within the province of the Cooperative Research Council. It is the intent of the Council that such matters shall be promulgated by appropriate existing agencies."

The American Petroleum Institute and the Society of Automotive Engineers govern the Council. Cooperating, in supplying funds or services, are the Automobile Manufacturers Assn., the Aeronautical Chamber of Commerce, the National Bureau of Standards, and other technical societies such as the American Society for Testing Materials.

Council membership is 12, appointed for one year, six by each of the two governing bodies. Council members must be empowered to speak authoritatively for their companies on engineering policies, must be active in performing their functions and may not send proxies to Council meetings. B. B. Bachman is the first chairman and Dr. T. G. Delbridge the first vice-chairman.

The Council's functions are administrative, self-limited primarily to business phases. It believes that "they govern best who govern least." It prepares and administers budgets and supervises in general all activities and the secretariat. The officers of the latter are a

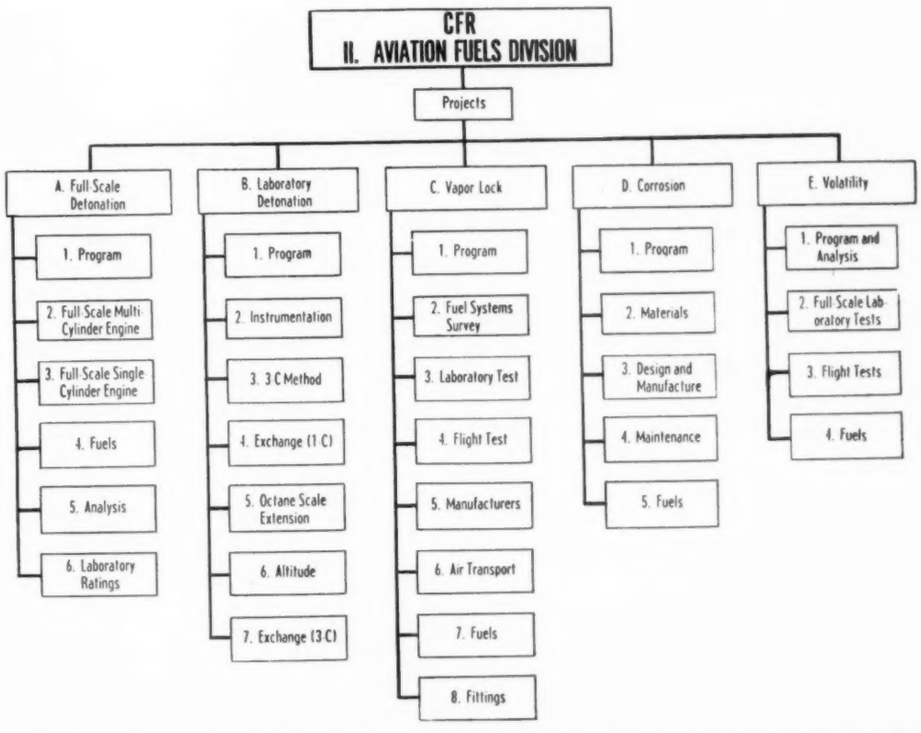


Fig. 2—Organization and projects of the Aviation Fuels Division of the Cooperative Fuel Research Committee of the CRC

manager and secretary, and a treasurer, Dr. R. P. Anderson, of the American Petroleum Institute.

Technical Organization

In its technical structure, the Council exemplifies the adage that "the child is father to the man." Both in procedure and in the selection of subject matter, it follows the pattern of Cooperative Fuel Research.

Activities are not fitted into a theoretical, a priori program. A research project is embarked on only when industry feels its need with sufficient urgency to contribute to it in men, material, and money. When the urgency of a problem has been demonstrated, the appropriate committee or division forms a working group to handle it, by appointing either a group leader, who selects his co-workers, or the group in its entirety. In either case, after the initial stages of its formation, the group becomes autonomous, selecting its own leader and members. These must be interested, qualified technicians who will do the actual research in their suitably equipped laboratories. Group leaders are solely responsible for work under their direction. Working groups are not only the foundation for the entire technical committee structure of the Council; they are also the most important factors in the whole plan for securing prompt and satisfactory research results.

Working groups concerned with allied topics are classified under an appropriate collective title. For each such classification, a project director correlates and guards against overlapping among the projects assigned to him, and the projects assigned to other classifications and under other directors. These classifications are, in turn, grouped into divisions, whose members, group leaders, and project directors, elect their chairmen. Project directors are either appointed by division chairmen or elected by the combined groups whose scope they are to control.

Finally, divisions are grouped into four main committees. Members of committees are representatives of the companies in whose laboratories and by whose personnel the projects of the working groups are being carried out. Each main committee has an assignment committee, consisting of the chairman of the main committee, the chairmen of the divisions, and regional representatives. The assignment committees guard against overlapping of effort throughout the entire field sponsored by the Council, and may call upon project directors and group leaders to meet with them.

Three special points must be noted in connection with the procedure and organization outlined. First, due to wartime exigencies, the rule restricting to industry the initiation of projects has been relaxed. The Ordnance Department, for instance, has requested that the technical committees themselves suggest problems which should be considered, to the end that necessary information may be available before the problem becomes urgent. Also, the secretary, for questions of immediate urgency in relation to the war effort, may get projects under way. Second, in certain instances, the number of laboratories studying a given subject has been so large that to have all of them represented on the working group would result in an unwieldy body. Special measures are taken in such cases to insure equitable representation and effective participation for the interested laboratories. Third, a hierarchy of committees of strictly logical structure and identity of classification and nomenclature throughout is not sought. For instance, in the Motor Fuels Division, vapor lock is part of the volatility project; in the Aviation Fuels Division, it is a separate project coordinate with volatility. Factors in deciding the status of a project are: the personnel involved, the organization of the industry interested, the importance and urgency of the subject in relation to existing projects. "Get the job done," not "follow the system," is the principle.

Technical Scope

The titles of the Council's four main committees cover its technical scope. The Cooperative Fuel Research Committee has come under its sponsorship without change. The five divisions of this Committee deal with motor, aviation, automotive-diesel, and non-petroleum fuels, and with the gasoline survey.

The Cooperative Lubricants Research Committee has taken over the programs of the following former SAE groups: Petroleum Group of subdivision B of the Lubricants Division of the Standards Committee, Aircraft-Engine Lubricants Research Committee, Crankcase Oil Stability Research Committee, Engine Wear Research Committee, and the Extreme-Pressure Lubricants Research Committee. Its three divisions are: Engine Oil, including projects on performance and test methods; General, dealing with chassis, transmission and gear lubricants, and hydraulic fluids; and Lubrication, for the study of the fundamentals of lubrication theory and practice.

The Cooperative Equipment Research Committee is concerned with mechanical design features, of either engine or vehicle, involved in the usage of fuels or lubricants. This committee will study the problems and present the viewpoints of oil men, equipment manufacturers, and consumers or operators.

The fourth committee, the War Advisory Committee, is in membership and functions, the former CFR-SAE Fuels and Lubricants Advisory Committee. It maintains contact with our military services and other government agencies. (Fig. 1 shows the organization of the committees and divisions of the Cooperative Research Council. Fig. 2 shows the organization and projects of the Aviation Fuels Division of the Cooperative Fuel Research Committee, a typical CRC division.)

Descriptions of projects and reports of results must be carefully circumscribed, since practically all of our current research pertains to our armed services. However, it is no military secret that our airplanes, tanks, motor trucks, and guns are being used in the tropical climate of the South Seas and the Libyan Desert, and in the sub-zero temperatures of Alaska and the steppes of Russia. Our research is concerned with all these types of equipment and its operation over these wide temperature ranges.

Examples of Current Activities

A few details concerning the current activities of each of the four main committees may adequately indicate the nature of the research sponsored by the Council.

The Cooperative Lubricants Research Committee, since May 1, 1942, has organized on the CFR pattern the activities of the bodies whose functions it assumed. It has more than 20 active projects in its three divisions, and has already released its first major report, the results of a cooperative program of laboratory bench tests on engine oils. This report was presented as a paper at the S.A.E. National Fuels and Lubricants Meeting at Tulsa, Oct. 22 and 23, 1942.

On the current program of the Cooperative Equipment Research Committee an item of pertinent interest is the 1942 Motor Survey. Seven companies contributed data to this survey and a report based on these data has been prepared by the Bureau of Standards. In former years the purpose of these surveys has been the determination of the fuel quality requirements of automobiles with respect to vapor lock and knock. The current survey has been adapted to present conditions by providing information on the need and extent of changes or adjustments which automotive equipment may require to operate satisfactorily on fuels of lower octane number and impaired volatility, and by investigating the resultant effects of such changes or adjustments on power, economy, maintenance, and other operating characteristics.

The Cooperative Fuel Research Committee, firmly established and in full operation when it came under the sponsorship of the Cooperative Research Council, has a great number of active projects. Four of these, on which reports of major importance have been issued since May 1, 1942, will serve as illustrations.

The Motor Fuels Division issued its third triennial analysis of the Precision of Motor Fuel Testing. This was based on 7000 knock ratings on 183 fuels and on inspection data on 109 of these fuels. The knock ratings were obtained from monthly Motor Fuels Exchange Tests, in which 19 laboratories participate, and from semi-annual exchange tests, in which about 70 laboratories participate. In addition to its evaluation of knock testing, the report also analyzed the precision of measurements of vapor pressure, gravity, and distillation temperatures.

During July, 1942, the road test group of the Motor Fuels Division participated in a series of tests under the auspices of the Quartermaster Department to determine the octane

requirements and vapor locking characteristics of Quartermaster Corps Vehicles in Desert operation. The work of the group, conducted at Camp Seeley, Cal., was covered in a 58-page confidential report to the Quartermaster.

The Automotive Diesel Fuels Division recently completed a series of full-scale engine tests to determine the effect of cetane number, volatility, gravity, and viscosity on five factors of engine operation: (1) engine deposits, (2) odor and lachrymation, (3) ignition quality under low-temperature starting conditions, (4) power output, fuel consumption, exhaust cleanliness, and (5) engine smoothness. Seven fuels were so selected as to permit the variation of a single physical property while all other properties remained constant. A 55-page analysis report on these data has been completed and is now undergoing editorial revision.

A confidential report to the Aeronautical Board on the detonation rating of fighting grade aviation fuel has been made by the Aviation Fuels Division. This was based on full-scale engine ratings of 14 fuels under take-off and simulated cruising power conditions. Other detonation projects are full-scale single-cylinder tests and two monthly exchange tests of the laboratory groups. Extensive programs on volatility and vapor lock, involving expenditures running well into six figures, have been prepared by the Aviation Fuels Division as the basis for contracts with the Army Air Forces and the Navy Bureau of Aeronautics.

Some Wartime Projects

In general, major interest naturally centers at this time on the activities of the War Advisory Committee. The problems of the armed services are presented to the Council through the War Advisory Committee. Two exceptions must be noted; both are aimed at using existing facilities most expeditiously. All projects on aviation fuels come directly under the province of the Aviation Fuels Division, which maintains contact with the Army Air Forces and the Navy Bureau of Aeronautics. The Aviation Fuels Division has behind it a long history of such activity, extending back to pre-war emergency days, and so has had available the experience and machinery for handling quickly and effectively the fuels problems of wartime aviation. The second exception is that a subject may be brought directly to the attention of a committee, division, or working group, where such a body is working on an allied topic, or includes in its membership a representative of the service branch directly interested in the problem.

Official recognition is accorded the War Advisory Committee or other main committees, in all matters of fuels and lubricants and their military utilization, by the following bodies: War Department Committee on Liquid Fuels and Lubricants, Ordnance Department, Quartermaster Corps, Corps of Engineers, Chemical Warfare, Signal Corps, Army Air Forces, Navy Bureau of Aeronautics, National Bureau of Standards, Bureau of Mines, Bureau of Economic Warfare, Office of Defense Transportation, the British Air Ministry, and the National Research Council of Canada.

When any of these bodies places a question before the War Advisory Committee, the latter immediately takes such action as will bring quickest results. If an appropriate working group is already in existence, the project is assigned to it. If not, the War Advisory Committee forms the group, or authorizes the secretary to do so. This flexibility of procedure has so speeded up the organization of research as, in some instances, to shorten to a single working day the period between the putting of the question and the start of actual investigation. After such a project has gotten under way it is assigned to the appropriate committee and division, so that the War Advisory Committee may keep itself free for its primary functions of contact and administration.

Sixty-eight questions put by the armed services have been considered and have had recommendations made concerning them by the War Advisory Committee. They have necessitated research and experimental work in 38 projects: 15 concerned with crankcase oil and engine lubrication, 12 with transmission and gear lubrication, five with other lubrication problems, and six with fuel and its utilization.

Within the realm of engine crankcase lubrication the following subjects have been included: oil filters; air cleaners; engine wear; engine-oil characteristics; used engine oils, including reclaiming, re-refining and test procedures for their evaluations; cold starting, including priming systems, dilution, heaters, and oil pumpability; specifications and acceptance tests for both heavy and moderate-duty oils; top cylinder lubricants and compatibility of specification oils.

Transmission and gear lubrication has called for study on the following phases: temperature effects on various grades of lubricant; requirements for operation under both extremely low and extremely high-temperature conditions, and corrosion in the presence of water.

Of particular current interest are the investigations on grease. Cooperative research on greases was practically non-existent until war requirements called for a great amount of information that could be obtained only experimentally. First one, and later two, working groups cooperating with the laboratories of the three arsenals undertook intensive programs dealing with test methods for stability, low-temperature evaluation, pumpability and water resistance of greases, studies of greases for recoil and equilibrator mechanisms, rust-inhibiting greases, and lubrication of high-speed artillery carriages.

Miscellaneous lubrication studies are concerned with specifications for wheel bearing greases, stability test methods for torque and converter fluids, relative merits of grease and oil for universal joints, and the lubrication of ferrous metal combinations substituted for critical non-ferrous metals.

In the field of fuels, the War Advisory Committee has initiated projects on the effect of sulfur in gasoline, special fuel additives, the octane requirements of military vehicles, and vapor-pressure tolerance of military vehicles, including tanks.

Of civilian as well as military interest is the study being made on the preparation of vehicles for storage and reconditioning for service, in so far as fuels and lubricants are concerned.

Future of Cooperative Research

Those of us familiar with small-boat operation appreciate keenly the difference in arduousness and risks as between fair and foul weather. In fair weather, the course is clearly discernible and easily followed. The skipper and crew have easy jobs, with plenty of time for relaxation. Foul weather may come in the shape of high winds, which toss about both buoys and boat and make the task of finding and following the course difficult. It sometimes takes the form of fog, which may totally blank out your surroundings and lure the mariner caught out without a compass into sailing a circular course. Even a lighter fog is baffling, since it distorts the shapes of familiar landmarks. Or the shifting gray of a driving rain may alternately reveal and obscure channel markers. Under such circumstances both captain and crew must be on deck, continuously alert. Every eye is strained to search out the course, every set of muscles is ready for emergent and strenuous action. Full compensation is the thrill of bringing your craft into a safe harbor, with gear intact, having successfully pitted your skill and strength against unpredictable and uncontrollable forces.

Launched by the petroleum and automotive industries, the Cooperative Research Council has slid down the ways into the troubled seas of wartime industry. It has, and will receive, the needed service of its captains and crews, participants in laboratories of both industries, in untiring zeal, technical skill, and harmonious cooperation. Our immediate goal is to help bring to our nation a day of relief and exultation such as it knew on Nov. 11, 1918.

For the post-war future we envisage ever-extending voyages of investigation. Our allies, the Chinese, the most rational people in the world, have no word in their language for either yes or no. So it is with research, which may never reach a static state of definite answers to every question; since it is a dynamic force, adapting itself to ever-changing current needs and finding each solution only a bend in the river opening up further vistas of inquiry. In a post-war world our type of research will have both economic and social appeal. It deals with the effective utilization of our natural resources, now subjected to the drain and wastage of war. Substituting coordination for competition as between our two great industries, it will be in harmony with what we hope will be the new way of life—achievement through voluntary peaceful cooperation.

The Effect of Vapor Load on Plate Efficiency of Fractionating Columns*

By George Granger Brown and Frank J. Lockhart**

The effect of fractionating column loading on relative plate efficiency was studied through analysis of data from tests on a commercial fractionating tower and tests on 2 laboratory columns. From these analyses it was concluded that over-all plate efficiency is largely independent of mass vapor velocity over a wide range of normal operation. At abnormally low vapor velocities the plate efficiency decreased abruptly in the commercial column probably due to its design, as compared with a slow decrease in the laboratory columns.

It was found that an equation which has been earlier proposed for estimating the maximum vapor load of a column may also be used to estimate the effect of vapor load on plate efficiency. The data for both the commercial and laboratory columns show maximum plate efficiencies at or near the maximum vapor load predicted by this equation, all the columns showing a gradual decrease in efficiency above the predicted maximum vapor load.

IN THE design of fractionating columns the number of plates and the column height are determined by the desired separation, the operating conditions, and the plate efficiency. The column diameter is usually determined by the allowable vapor velocity with due regard for the liquid downflow requirement.

The relation between the number of equilibrium plates, the desired separation, and the operating conditions has been discussed many times in the literature and is well understood. Although it has been recognized that column diameter as controlling the vapor load has an important effect on plate efficiency, there is not generally available any relationship which might serve as a basis for quantitative estimates of the effect of vapor load on plate efficiency. This effect may be so pronounced in many cases that economic considerations would require operation at some vapor load appreciably less than the actual limit of mechanical capacity.

This study is an attempt to determine the effect of vapor load on plate efficiency in a commercial gasoline fractionator as a means of relating the available laboratory data to commercial operations.

Maximum Capacity Based on Vapor Velocity

In commercial fractionators the capacity may be limited by the inability of the column to handle liquid (priming or flooding), or by high vapor velocities causing excessive entrainment or "coning" of the liquid away from the bubble caps. The maximum amounts of liquid that can be passed downward and vapor that can be passed upward per unit time are not definitely fixed by the mechanical design and the properties of the materials being processed, but are inter-dependent, a change in liquid throughput affecting the maximum vapor throughput, and vice versa.[18]

In many commercial fractionators it has been found that the vapor capacity is the controlling factor determining the column capacity. As an effort to approximate the safe limits of column loading, Souders and Brown[17] suggest a maximum vapor load estimated by an empirical factor in connection with an expression derived from Stokes' Law applied to entrainment:

$$G = C[p_v(p_l - p_v)]^{1/2} \qquad (1)$$

where, G = allowable mass velocity of the vapor, lbs./(hr.) (sq. ft.)
C = empirical factor, a function of plate spacing and surface tension
p_v = density of vapor, lbs./cu. ft.
p_l = density of liquid, lbs./cu. ft.

As entrainment is generally not the limiting factor in gasoline fractionation, the above equation gives values of column diameter which are quite conservative. Columns known to be operating satisfactorily show mass velocities 20 to 40% greater than that indicated by this equation.[1,14]

Based on the relatively careful analyses of an actual operating column, it has been found that this equation may also be used as a basis for estimating the effect of vapor load on plate efficiency.

Previous Data on Plate Efficiency

A number of individual tests giving plate efficiencies for commercial gasoline fractionators [1,3,4,7] and for oil fractionators [6,12,13,16] have been published, but data showing the effect of column loading on plate efficiency are limited and incomplete.

A natural gasoline fractionator operating at 300 lbs. per sq. in. absolute pressure and at a ratio of actual mass vapor velocity to that calculated from the Souders-Brown equation (G_{act}/G_{eqn}) of 0.745 has been found to have a rectifying plate efficiency of 108%,[4] while an oil fractionator at atmospheric pressure operating at (G_{act}/G_{eqn}) of 0.60 has an overall plate efficiency of 90% [13,16].

Gunness [7] reported the individual plate efficiency of a commercial gasoline fractionator as substantially constant at 100% between vapor velocities of 0.06 and 0.19 ft. per second at 255 lbs. per sq. in. absolute pressure. No efficiencies at velocities above this, which correspond to a ratio of (G_{act}/G_{eqn}) of 0.55, were given since the capacity was limited by external factors.

Carey, Griswold, Lewis, and McAdams [5] reported data on the distillation of benzene-toluene mixtures in a ten-plate laboratory column, with one bubble-cap per plate, at 16-in. plate spacing. The bubble-caps were 2 in. wide and extended entirely across the 8-in. diameter column. The efficiency was found constant at 69% over the range 0.2 to 2.0 ft. per second, and to decrease gradually to 59% at 2.5 ft. per second vapor velocity. The capacity of this column was limited by lack of heating surface to a G_{act}/G_{eqn} ratio of 1.21.

Peavy and Baker [15] reported data on the distillation of ethyl alcohol-water mixtures in a three-plate laboratory column, with 10 caps per plate, at plate spacings of 6, 12, and 18 in. The plate efficiency increased to a maximum value of 120% with increasing vapor velocities of low magnitudes, remained constant between 1 and 3 ft. per second velocity, and decreased with increasing velocities above 3 ft. per second. For plate spacings of 6 and 12 in. the reduction in efficiency with increased velocity could be satisfactorily explained on the basis of entrainment, but for the 18-in. spacing the decrease in plate efficiency was more than that estimated from considerations of the quantity of entrainment alone.

Test Data on a Commercial Gasoline Fractionator

The data used in the present computations were obtained in a series of tests made some years ago on a commercial gasoline fractionator [10] by the M. W. Kellogg Co. to whom the authors are indebted for permission to publish this study.

The column was 6 ft. in diameter, 85 ft. high and contained 30 actual plates, with the preheated feed introduced on the tenth plate from the bottom. Plates were spaced at 30 in. with 34 bubble caps (6¾ in. diameter by 4 in. high) per plate. Each cap had 24 slots 1¼ in. high, and ⅜ in. wide at the top and ½ in. wide at the bottom, with no skirt. Submergence (the height above the plate) was ½ in. at zero flow on all plates, due to the location of the drain holes, and at normal flow was 1⅞ in. on rectifying plates and 2¼ in. on the stripping plates. Riser area was 10.5% of the column cross-sectional area. Down-comers were tapered with an area 16% of the column

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**Department of Chemical and Metallurgical Engineering, University of Michigan, Ann Arbor.

area at the top and 9% at the lower end. Weir lengths on rectifying plates were 128 in. and on the stripping plates, 114 in.

The reflux was split, flowing past two successive rows of bubble-caps in its travel across one-half of a plate, from the sides in toward the center, down to the plate below, and outward to the perimeter on alternate plates.

Two series of tests were made, one at 250 and one at 200 lbs. per sq. in. gage pressure. The vapor rate was varied by changing the quantity of overhead reflux. Changes in feed rate were unintentional and due to changes in operation in other parts of the refinery.

In all tests the column was operated at steady-state conditions for some time, and composite samples were collected over a 6-hour period.

Temperatures of the feed, bottoms, and reflux were taken with thermometers. All other temperatures were obtained with standard operating thermocouples.

Quantities of bottom product were obtained from tank gages. All other rates were taken from operating orifice meters.

A summary of operating conditions and analyses is given in Tables 1 and 2. The reported temperatures are probably accurate to 2° F., the pressures to within 3 lbs. per sq. in., the tank gage quantity to 1% and metered rates to 3%.

The feed stock came from cracking units and contained unsaturated hydrocarbons which were not separately determined. All analyses were reported in terms of paraffin hydrocarbons, which makes the absolute accuracy of the calculated plate efficiencies subject to some question.

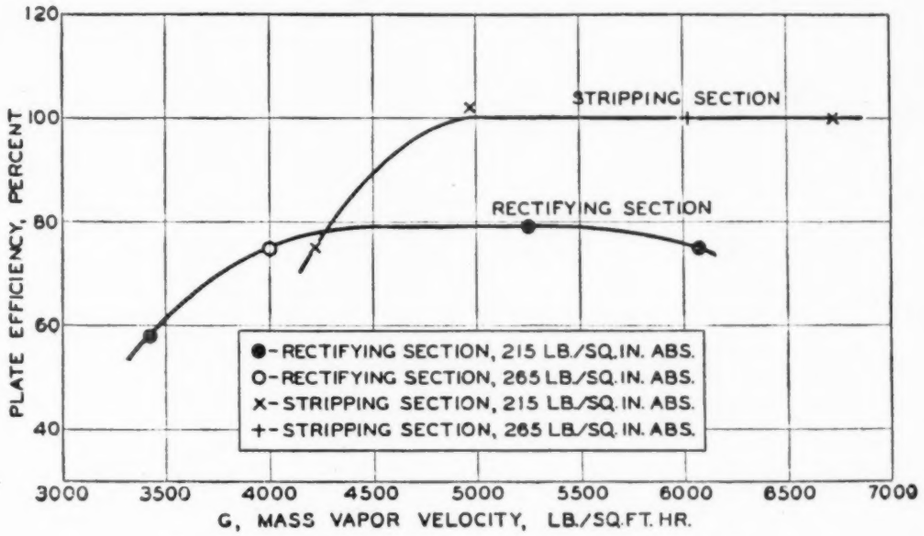


Fig. 1—Over-all plate efficiency versus mass vapor velocity

Accuracy of flow rates has been verified in that all over-all material balances agree within 3%, the metered feed being lower in all cases. Balances for individual components check poorly in some cases, probably due to uncertainties in the Podbielniak analyses as run some 10 years ago.

Heat balances made around the column using the latest enthalpy data [8] were consistent with the accuracy of temperature measurement. Temperatures calculated from stream compositions and vaporization equilibrium constants [2] agree within 2° F. with the temperatures as measured at the condenser, the top plate and the reboiler in all cases.

Two methods are commonly employed for expressing the rectification performance of a bubble-cap plate, the over-all plate efficiency and the individual or Murphree plate efficiency. The over-all plate efficiency, defined as the ratio of the number of equilibrium plates to the number of actual plates required for the separation, is ordinarily the more convenient.

The number of equilibrium plates required

Table 1—Operating Conditions

Test	F		E		H		J	
	Test	Calc.	Test	Calc.	Test	Calc.	Test	Calc.
Pressure, Lb./Sq. In. Gage								
Tower	200		250		203		208	
Reflux Drum	190		235		195		198	
Temperatures °F.								
Feed	188		201		238		229	
Top	125	127	147	149	128	131	133	131
Dry Gas	100	107	121	127	103	107	106	110
Reflux	104	107	123	127	106	107	109	110
Feed Tray	199	195	221	218	207	205	210	207
Bottoms	269	268	287	289	272	273	275	273
Reboiler Inlet	246	241	268	261	246	243	251	245
Reboiler Outlet	272		293		277		278	
Rates, Moles per Hour								
Feed		1118	1300	1339	783	806	1037	1063
Bottoms	665		855		476		622	
Dry Gas	453		484		330		441	
Reflux	1649		1928		2841		3220	
Mole % Vapor in Feed		24		10		65		58
Reflux Ratios								
L/V		0.788		0.802		0.897		0.880
$\overline{L/V}$		1.363		1.328		1.190		1.200

Table 2—Stream Compositions in Mole Per Cent

Test	F	E	H	J
Reflux	*			
C_2H_6	7.10	6.80	7.71	7.03
C_3H_8	66.00	61.40	62.54	62.53
iC_4H_{10}	23.90	27.03	27.93	28.57
nC_4H_{10}	3.00	4.77	1.82	1.87
Gas				
C_2H_6	21.80	20.00	19.58	19.32
C_3H_8	66.30	64.50	68.04	66.19
iC_4H_{10}	10.93	13.77	11.64	12.82
nC_4H_{10}	0.97	1.73	0.74	1.67
Bottoms				
C_3H_8	0.15	0.	0.	0.
iC_4H_{10}	6.05	3.73	1.66	2.0±
nC_4H_{10}	32.00	34.65	35.85	35.20
iC_5H_{12}	12.90	13.46	12.53	12.76
nC_5H_{12}	19.55	20.40	18.98	19.33
C_6H_{14}	12.53	11.88	13.28	13.13
C_7H_{16}	16.82	15.88	17.70	17.58
Feed†				
C_2H_6	8.84	7.24	8.02	9.10
C_3H_8	26.92	23.30	27.83	26.50
iC_4H_{10}	8.03	7.35	5.75	6.75
nC_4H_{10}	19.40	22.70	21.48	20.83
iC_5H_{12}	7.67	8.59	7.41	7.46
nC_5H_{12}	11.64	13.05	11.24	11.38
C_6H_{14}	7.46	7.59	7.81	7.69
C_7H_{16}+	10.04	10.18	10.46	10.29

*Calculated value in equilibrium with reported gas analysis.

†Calculated as sum of overhead distillate gas plus bottoms.

Table 3—Effect of Column Load on Plate Efficiency

Test	Density Lb./Cu. Ft. Liquid	Density Lb./Cu. Ft. Vapor	Liquid Overflow Rate Gal./Hr.	Mass Vapor Velocity Lb. Sq. Ft. Hour Actual	Mass Vapor Velocity Lb. Sq. Ft. Hour Equation	G_{act} / G_{eqn}	Plate Efficiency %
		Rectifying	Section (Top Plate	Temperature and	Pressure)		
F	30.25	2.10	20,250	3425	4700	0.728	58
E	28.50	2.55	25,520	3995	4970	0.803	75
H	29.80	2.12	35,800	5245	4660	1.125	79
J	29.80	2.12	40,700	6070	4670	1.300	75
		Stripping	Section (Reboiler	Temperature and	Pressure)		
F	30.70	2.46	45,000	4220	5420	0.778	75
E	29.40	2.99	65,100	6020	5780	1.042	100
H	30.45	2.46	44,200	4970	5400	0.921	102
J	30.45	2.46	63,200	6730	5400	1.245	100

for the separation in each case has been calculated by the plate-to-plate method of Lewis and Matheson. [11] By means of heat and material balances the liquid and the vapor rates were computed for three plates down from the top and three plates up from the reboiler. The internal reflux ratios L/V and $\overline{L/V}$ were substantially constant throughout each section of the column; maximum deviations from the mean values were less than 2% and occurred at the top plate and the reboiler. Calculations were continued to the feed plate using average values of the reflux ratios in all cases.

The over-all plate efficiencies have been calculated for the rectifying and for the stripping sections of the column and are tabulated in Table 3.

The liquid loads in gallons per hour and the vapor mass velocities have been calculated for the top plate conditions in the rectifying section and for reboiler conditions in the stripping section because of convenience. The vapor load at the top plate is very nearly the maximum vapor load in the rectifying section.

The maximum vapor loads predicted by Equation (1) have been calculated at the same places in the column, using $C = 610$ in the rectifying section, which corresponds to a plate spacing of 30 in. and an assumed surface tension of 10 dynes/cm., and 650 in the stripping section, which corresponds to a plate spacing of 30 in. and an assumed surface tension of 15 dynes/cm. Vapor densities have been calculated from compressibility factors, using pseudocritical temperatures and pressures as suggested by Kay[9]. Liquid densities were computed as the average of the densities of pure components at standard conditions and then corrected to the temperature and pressure.

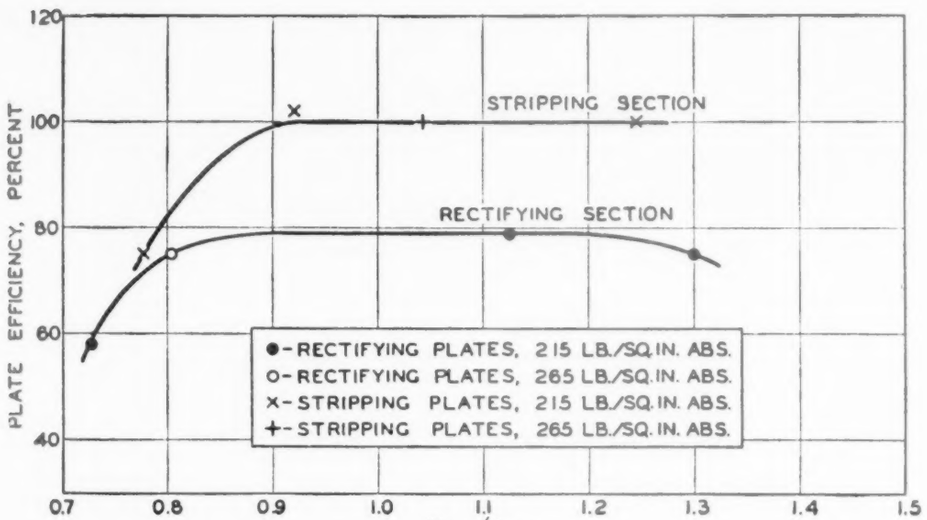
Discussion

Since this study is not concerned with the actual plate efficiency but only with the effect of column loading on the relative plate efficiency, variations in plate design, spacing and submergence are of minor consideration except in so far as they may influence the effect of vapor load on plate efficiency.

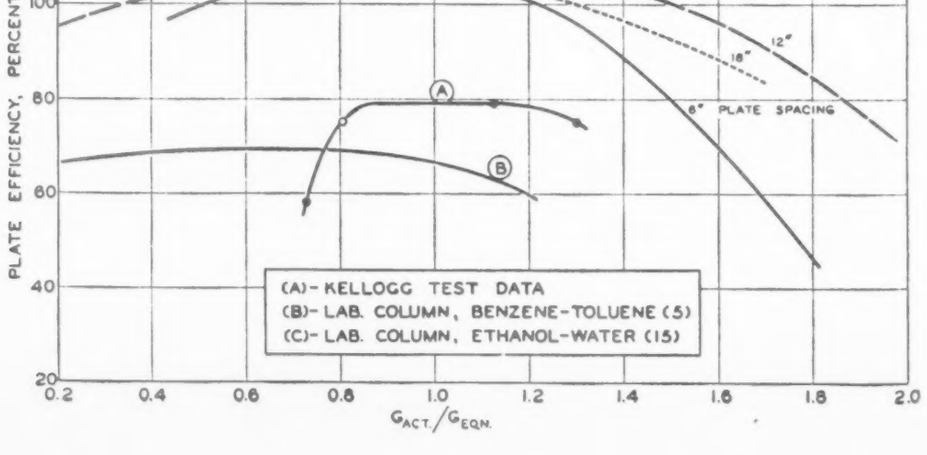
Since the vapor rate was varied by changes in the pump-back reflux, the liquid downflow rate changed proportionately. Excessively large changes in liquid rates would influence the vapor-liquid contact and entrainment, but the test column apparently had adequate liquid downflow capacity since the pressure drop across the column did not change to any appreciable extent. It has been shown for laboratory columns that at the critical loading point, which depends on both liquid and vapor rates, the pressure drop increases by threefold or more.[15] No sudden or large increase in pressure drop with increased vapor rate was found in any of the tests, and the critical liquid flow was not reached. Tower operation was smooth during all tests with no apparent flooding or priming.

Over-all plate efficiencies are plotted in Fig. 1 as a function of the mass vapor velocity for the rectifying and the stripping sections. At unduly low vapor rates the low plate efficiencies are probably caused by the decreased liquid level on the plates (a greater proportion of liquid flowing down the drain-holes) and channelling of the vapor due to slight differences in fluid head across the plates. At intermediate vapor velocities, within the range of normal operation, increases in vapor load correspond to increased submergence, better agitation, and longer vapor-liquid contact, but also to increased entrainment. The net result appears to be counterbalancing of opposing factors with little change in plate efficiency over a wide range. The decreasing efficiency of the rectifying plates with higher vapor velocities is probably due to increased entrainment and "coning" of the liquid back from the caps, effectively decreasing the vapor-liquid contact.

In Fig. 2 over-all plate efficiencies are plotted as a function of the ratio of the actual mass velocity to that calculated from Equation (1) for both sections of the column. Maximum plate efficiencies are obtained at or close to the maximum vapor load predicted by Equation (1). The efficiency of the rectifying plates shows a gradual decrease with higher vapor loads, while the efficiency of the stripping plates appears to remain constant within the



ABOVE — Fig. 2 — Over-all plate efficiency versus vapor load



RIGHT — Fig. 3 — Rectifying plate efficiency versus vapor load

limits of the data. Souders and Brown[17] point out that a greater mass velocity may be tolerated in the stripping section than in the rectifying section of the same column.

Fig. 3 shows the rectifying plate efficiencies vs G_{act}/G_{eqn} for the laboratory columns with benzene-toluene[5] and with ethyl alcohol-water,[18] and for the present tests on a commercial column. The outstanding difference between the laboratory and the commercial columns is the abrupt decrease in plate efficiency of the latter with decreasing vapor load. This is attributed to the design of the commercial column. In both the laboratory and the commercial columns plate efficiencies reach a maximum at or close to the maximum vapor load predicted by Equation (1) and decrease gradually with higher vapor loads.

Summary and Conclusions

Based on the relatively careful analysis of a commercial gasoline fractionator and on the tests previously reported on two laboratory columns, it has been found that the over-all plate efficiency is largely independent of the mass vapor velocity over a wide range of normal operation. At abnormally low vapor velocities the plate efficiency decreases very slowly in the laboratory columns and quite abruptly in the commercial column, probably due to the column design.

The two laboratory columns and the commercial column show maximum plate efficiencies at or near the maximum vapor load predicted by the Souders-Brown equation.

All of the columns studied show a gradual decrease in efficiency above this predicted maximum vapor load. In the commercial column, the efficiency of the rectifying plates is constant up to a mass vapor velocity of 1.2 times the predicted maximum and then decreases at higher vapor rates. The efficiency of the stripping plates is constant to at least 1.25 times the predicted maximum vapor velocity.

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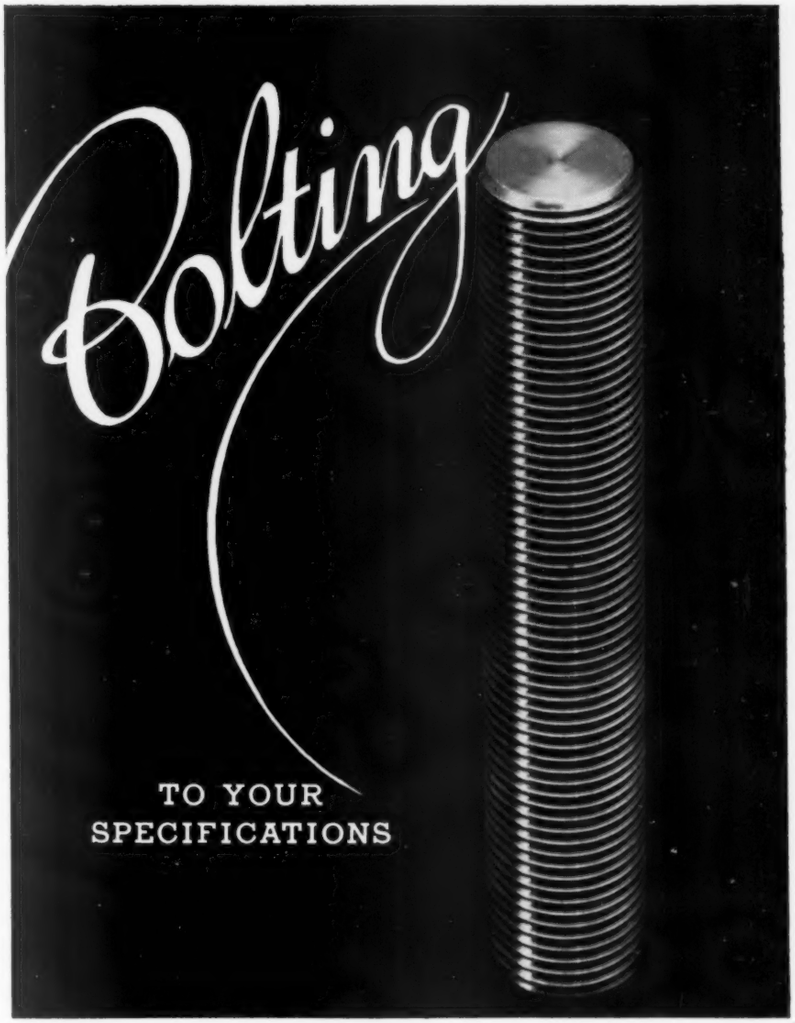

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